

Wine and the vine in ancient Italy: an archaeological approach

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1. Introduction

Wine was both a daily drink and reserved for special occasions in antiquity, played a key role in trade and the economy, and was found in medicinal, religious, domestic, and commercial contexts. Roman winemaking and viticulture were traditionally interpreted through (often-scattered, incomplete and biased) historical sources and, to an extent, comparative ethnography¹. Increasing attention on Roman agriculture over recent decades, buoyed by improvements in technology and a growing methodological skillset, has, however, created an archaeological dataset that now plays a crucial role in confirming, tweaking or refuting historic interpretation².

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¹ J.P. Brun, *From oil to wine? A balanced view on the production of the most representative agricultural products of antiquity*, in J.P. Brun, N. Garnier, G. Olcese (eds.), *Making wine in western-Mediterranean. Production and the trade of amphorae: Some new data from Italy. Panel 3.5*, Archaeology and Economy in the Ancient World 9, Propylaeum, Heidelberg 2020, p. 3.

² In particular, «a revolution in scientific techniques over the past forty years has made it possible to re-examine and, in many cases, re-write the history of

This chapter focusses on the archaeological evidence available and how it illuminates production of the dominant beverage in Italian antiquity-wine. Archaeometric techniques, including geophysical and chemical analyses, are included alongside traditional methods of survey and excavation. Discussion is mostly restricted to the Italian peninsula within the bounds of the Early Roman period to Late Antiquity (c. 8th century BCE to 600 CE). Such temporal and geographical confines allow discussion of winemaking and use for both domestic and export markets, through periods of prosperity and decline³, on various scales and for a

wine»: P. McGovern, *From east to west: The ancient Near Eastern "wine culture" travels land and sea*, in S. Perez, J. Perez (eds.), *Patrimonio cultural de la vid y el vino: Vine and wine cultural heritage*, Universidad Autónoma de Madrid, Madrid 2013, p. 234.

³ Roman winemaking in Italy went through peaks and troughs, dependent on a range of exogenous and endogenous factors of which space does not permit discussion here. Examples include the eruption of Mount Vesuvius in 79 CE, which reportedly destroyed a great number of Campanian vineyards and caused the so-called 'wine famine' in Rome, and, in the following centuries, the proliferation of viticulture in Hispania and Gaul that eventually out-competed local Italian viticulture. The latter is particularly visible through archaeological evidence, namely amphorae; though recent work suggests Italian viticulture continued to a greater extent than previously thought, albeit on a smaller scale and with different purpose: P. Arthur, D. Williams, *Campanian wine, Roman Britain and the third century A.D.*, in «Journal of Roman Archaeology», 5 (1992), pp. 250-60; E. De Sena, *An assessment of wine and oil production in Rome's hinterland: Ceramic, literary, art historical and modern evidence*, in B. Frizell, A. Klynne (eds), *Roman villas around the Urbs: Interaction with landscape and environment*. Proceedings of a conference at the Swedish Institute in Rome, (September 17-18, 2004), Roma 2005, p. 136; A. Marzano, *Agricultural production in the hinterland of Rome: Wine and olive oil*, in A. Bowman, A. Wilson (eds.), *The Roman agricultural economy: Organisation, investment, and production*, Oxford 2013, pp. 85-106; J. Rossiter, *Wine-making after Pliny: Viticulture and farming technology in Late Antique Italy*, in L. Lavan, E. Zanini, A. Sarantis (eds.), *Technology in transition: A.D. 300-650*, 2008, pp. 93-118; R. Volpe, *Vino, vigneti ed anfore in Roma Repubblicana*, in *Suburbium II. Il*

range of sociocultural groups, strata and purposes. This is supplemented by contemporary ancient texts, including some, most importantly Cato the Elder, Pliny the Elder and Varro, from the Italian peninsular itself⁴.

Archaeological evidence for ancient viticulture and winemaking generally falls into five broad categories: remains of grapes, vines or vineyard arrangements, including irrigation and hydrological systems; tools (*e.g.* billhooks) used in agricultural processes; components of wine presses; architectural structures (*e.g.* vats or treading floors); and metal, ceramic and more rarely organic evidence for the storage, transport and serving of wine. These categories largely align with the sequence of the following pages, observing evidence from cultivation and the harvest, through processing and production, to fermentation, storage and transport.

2. Pre-Roman influences in Italy

Spurred by recent developments in archaeometric, paleoenvironmental, geochemical and DNA analyses, theories regarding the origins of

Suburbio di Roma dalla fine dell'età monarchica alla nascita del sistema delle ville, (Atti del Convegno 16 settembre, 3 dicembre 2004 e 16-17 febbraio 2005), 2009, p. 381.

⁴ Major ancient agricultural treatises include Cato's pioneering *De Agri Cultura* (2nd c. BCE), Varro's *Res Rusticae* (37 BCE), Columella's *De Re Rustica* (1st c. CE) and Palladius' *Opus Agriculturae* (late 4th or 5th c. CE). Pliny the Elder (1st c. CE) provides one of the most comprehensive accounts of ancient viticulture and winemaking, devoting Book 14 in his *Naturalis Historia* to the subject. For Late Antiquity in Italy, Zeno of Verona in the mid-4th c. (*Tractatus* 2.27.2), Symmachus in the 4th-5th c. CE (*Ep.* 3.23.1), Cassiodorus in the mid-6th c. (*Exp. in Psalm. VIII*), and Pope Gregory in the 6th c. (*Dial.* 9) provide a glimpse into the contemporary winemaking process, which appears largely reflective of earlier sources. Although later, and outside the chronology of this chapter, the Byzantine Greek farming manual, *Geoponika* (10th c. CE), provides an equally useful and thorough discussion of viticulture, directly citing and drawing much of its material from earlier Greek and Roman sources.

wine and the vine have been developed. Despite its omnipresence, wine did not originate in Italy nor Roman culture, but more likely in the mountainous regions of Lebanon/anti-Lebanon, the Taurus, Caucasus, and Zagros⁵. Wild grapevines were present in Italy and exploited in various forms since the Mesolithic, with new evidence indicating, albeit circumstantially, possible beginnings of cultivation in the Bronze Age⁶; though uses of the grape (and vine) are many and it is difficult

⁵ On the origins of winemaking in Neolithic villages like Hajji Firuz Tepe as early as 7000 BCE, and the possibility of vine domestication stemming from the Near East, see J.P. Brun, *Archéologie du vin et de l'huile de la préhistoire à l'époque hellénistique*, 2004, pp. 37-39; P. McGovern, *Two luxury items of the Canaanites and Phoenicians' Royal purple and wine*, in *Forum II: Ligue des cités Cananéennes, Phéniciennes et Puniques*, 30 October 2009, 2009, pp. 185-86; P. McGovern, B. Luley, N. Rovira *et al.*, *Beginning of viticulture in France*. «PNAS», 110(25) (2013), pp. 10147-52; A.M. Mercuri, P. Torri, A. Florenzano *et al.*, *Sharing the agrarian knowledge with archaeology: First evidence of the dimorphism of vitis pollen from the Middle Bronze Age of N Italy (Terramara Santa Rosa di Poviglio)*. «Sustainability», 13 (2021), p. 13. Early evidence, ca. 7000 BCE, for a mixed wine drink has also been found in China: P. McGovern, J. Zhang, J. Tang *et al.*, *Fermented beverages of pre- and proto-historic China*, «PNAS», 101 (2004), pp. 17593-98.

⁶ G. Di Pasquale, E. Russo Ermolli, *Etruria – Le tracce più antiche della vite nel paesaggio: le grandi foreste planiziali*, in G. Di Pasquale (ed.), *Vinum Nostrum: Art, science and myth of wine in ancient Mediterranean cultures*, 2010, pp. 58-61; E. Dodd, *The archaeology of wine production in Roman and pre-Roman Italy*. «American Journal of Archaeology», 126 (3) (2022), p. 443-80, <https://doi.org/10.1086/719697>; A.M. Mercuri *et al.*, 2021 cit. n. 5, pp. 13-16; L. Motta, K. Beydler, *Agriculture in Iron Age and Archaic Italy*, in D. Hollander, T. Howe (eds.), *A companion to ancient agriculture*, 2020, p. 403; A. Trentacoste, L. Lodwick, *Towards an agroecology of the Roman Expansion*, in S. Bernard, L.M. Mignone, D. Padilla Peralta (eds.), *Making the Middle Republic: New Approaches to Rome and Italy, c. 400-200, BCE*, 2023, pp. 164-90. Early evidence for wild grapevines and grape consumption was found at the Epigravettian and Mesolithic sites of Grotta del Romito (Calabria), Grotta dell'Uzzo (Sicily), and Torre Canne (Apulia), and fossilised traces of

grapevine ancestors from c. 50 million years ago located near Verona and Vicenza in Northern Italy: J.P. Brun, 2004 cit. n. 5, p. 81; G. De Lorenzis, F. Mercati, C. Bergamini *et al.*, *Genomic tools to reconstruct the grapevine domestication and evolution in the western Mediterranean basin*, in J.P. Brun, N. Garnier, G. Olcese (eds.), *Making wine in western-Mediterranean. Production and the trade of amphorae: Some new data from Italy. Panel 3.5. Archaeology and Economy in the Ancient World 9*, 2020, p. 23; F. Grassi, M. Labra, S. Imazio *et al.*, *Phylogeographical structure and conservation genetics of wild grapevine*, «Conservation Genetics», 7 (2006), p. 837; S. Marvelli, S. De Siena, E. Rizzoli *et al.*, *The origin of grapevine cultivation in Italy: The archaeobotanical evidence*, «Ann. Bot.», 3 (2013), pp. 155–59. Grapevines may have been exploited in Neolithic Italy – grape seeds occur in several Early Neolithic sites of N Italy, from Friuli to Liguria, with some evidence of vine management – and cultivation is increasingly likely from the Final Bronze Age (c. 1200-1000 BCE), visible through the remains of pruned vines in a rubbish pit at Santa Maria Capua Vetere in Campania: D. Arobba, R. Caramiello, M. Firpo *et al.*, *New evidence on the earliest human presence in the urban area of Genoa (Liguria, Italy): a multi-proxy study of a mid-Holocene deposit at the mouth of the Bisagno river*, «Holocene», 28 (12) (2018), pp. 1918-35; A. Gismondi, G. Di Marco, F. Martini *et al.*, *Grapevine carpological remains revealed the existence of a Neolithic domesticated Vitis vinifera L. specimen containing ancient DNA partially preserved in modern ecotypes*, «JAS», 69 (2016), pp. 75-84; D. Lentjes, G.S. Semerari, *Big debates over small fruits: Wine and oil production in protohistoric southern Italy (ca 1350 – 750 BC)*, «Babesch», 91 (2016), p. 6; M. Rottoli, E. Castiglioni, *Prehistory of plant growing and collecting in northern Italy, based on seed remains from the early Neolithic to the Chalcolithic (c. 5600–2100 cal B.C.)*, «Vegetation History and Archaeobotany», 18 (2009), pp. 9-103. Pollen analysis revealed potential evidence for early grapevine cultivation c. 2000 BCE in the Massaciuccoli Basin, Tuscany, along with pips from Bronze Age contexts near Modena, and observation of domesticated traits via morphometric and molecular analyses in N Tuscany: B. Aranguren, P. Perazzi, *La struttura interrata della media età del bronzo di San Lorenzo a Grece a Firenze e l'inizio della coltivazione della vite in Toscana*, «Rivista di Scienze Preistoriche», 57 (2007), pp. 243-62; A. Cardarelli, G. Bosi, R. Rinaldi *et al.*, *Vino o non vino? Nuovi dati sui vinaccioli della Terramara di Montale (Modena) tra la fine della media età del Bronzo e il Bronzo recente*, in *Preistoria del cibo: 50^{ma} Riunione Scientifica dell'Istituto*

to determine a clear relationship between early cultivation and wine-making. Recent evidence does, however, make a strong case for Bronze Age, and perhaps even Neolithic, Italian cultures experimenting with grapes (whether wild, cultivated or domesticated) and fermentation at some point⁷. After all, Italy and the Aegean were part of an interconnected socio-economic network and it is unsurprising that further knowledge of vine cultivation and winemaking might be transferred⁸.

Italiano di preistoria e Protostoria, 2015; B.I. Menozzi, A. Fichera, M.A. Guido *et al.*, *Lineamenti paleoambientali del bacino del Lago di Massaciuccoli (Toscana nord-occidentale)*, «Atti Soc. Toscana Sci. Nat. Ser.», B 109 (2002), pp. 177-87. Perhaps also seen in increasing preference for, and exploitation of, grapevine over cornelian cherry in the Terramare culture around Ferrara from the Middle to Late Bronze Age, c. 1400-1170 BCE: A.M. Mercuri, C.A. Accorsi, M. Bandini Mazzanti *et al.*, *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 (2006), pp. 43-60.

⁷Quantities were almost certainly limited. See J.P. Brun, 2020 cit. n. 1, p. 7; A. Pecci, E. Borgna, S. Mileto *et al.*, *Wine consumption in Bronze Age Italy: Combining organic residue analysis*, «JAS», 123 (2020), pp. 1-12. Supported in the Middle and Late Bronze Age with exponentially increasing use of cups, strainers, bowls, craters and other vessels (in Mycenaean and local form) relevant to wine production and consumption: Cardarelli *et al.*, 2015 cit. n. 6; D. Lentjes, G.S. Semerari, 2016 cit. n. 6, p. 3. On Sardinia, it is now clear that vines were cultivated since the Early Bronze Age and wine consumed before the arrival of Phoenicians: A. Depalmas, C. Loi, N. Garnier, A. Pecci, *Wine in Sardinia: New archaeological data and research methodology*, in J.P. Brun, N. Garnier, G. Olcese, *Making wine in western-Mediterranean. Production and the trade of amphorae: Some new data from Italy. Panel 3.5*. Archaeology and Economy in the Ancient World 9, 2020, pp. 61-71. Evidence of cultivated grapevines from the Aeolian island of Salina as well as Vivara, nearby Ischia, illuminate Middle Bronze Age (c. 1500-1400 BCE) expertise in viticulture: J.P. Brun, 2004 cit. n. 5, p. 81.

⁸J.P. Brun, 2004 cit. n. 5, pp. 80-81 & 159; D. Lentjes, G.S. Semerari, 2016 cit. n. 6, pp. 1-3. See A. Cardarelli *et al.* 2015 cit. n. 6 for increasing

By no means was this a linear trend across Italy; archaeological and botanical evidence suggests highly localised uptake, in flux with regional and interregional socio-political and economic events, and variable diachronically from site-to-site often with centuries between.

The slow movement of wine production both westwards and within Italy is most visible archaeologically as early as the 10th or 9th centuries BCE via two streams of development: 1) established local viticultural practice in places where the native grapevine thrived (*e.g.* pressed grape residues at 10th-9th century Longola di Poggiomarino on the river Sarno, Campania, and Villanovan Gran Carro, Lazio [fig. 1])⁹; and 2) an influx of maritime Phoenician contact with native populations¹⁰.

Phoenician knowledge and influence are clearly observed through similarities in amphora and flask shapes and the transfer of technologies

traffic, including trade of ceramics and bronze objects, between Italy and the Aegean in the 14th-12th centuries BCE. Archaeobotanical material from Late Bronze Age Calabria (S Italy) suggests a peak in grapevine cultivation, beyond domestic need, and, shortly after, a decline to household levels by the end of the Bronze Age, perhaps linked to the disruption of trade routes with the Mycenaean world: D. Lentjes, *Planting the seeds of change: Landscape and land use in first millennium BC southeast Italy*, 2016. Winemaking, among other fermented grape products, was certainly present by this time on both mainland Greece and Crete, see J.P. Brun, 2004 cit. n. 5, pp. 70-80).

⁹ C. Cicirelli, C. Albore Livadie, L. Costantini *et al.*, *La vite a Poggiomarino, Longola: un contest di vinificazione dell'Età del Ferro*, in P. Guzzo, M. Guidobaldi, *Nuove ricerche archeologiche nell'area Vesuviana (scavi 2003-2006): atti del convegno internazionale, Roma, 1-3 febbraio 2007*, 2008, pp. 574-75; D. Lentjes, G.S. Semerari, 2016 cit. n. 6, p. 7. Longola, which has been submerged since the 4th c. BCE, revealed numerous grape pips, pruned vines and pressings.

¹⁰ An *askoide* pitcher from Telavè, Sardinia, shows residual traces of wine and has been dated through C¹⁴ to c. 1000 BCE: S. Marvelli *et al.*, 2013 cit. n. 6, p. 160.

like metalworking, glassmaking and ivory carving¹¹. Increasingly widespread contemporary evidence for grapevine cultivation across the Italian peninsular supplements this, perhaps linked to the transfer of new technical knowledge and cultivars¹². Indeed, Phoenician and earlier Canaanite cultures in the Levant long possessed considerable viticultural technical skill – knowledge that was communicated across their maritime trading network, from the Near East to North Africa, coastal Mediterranean Spain, France, Sicily, Sardinia, the Aeolian islands and Etruria¹³. These technical and practical aspects merged with sociocultural ideologies as local Italian (Villanovan and Etruscan) aristocracies soon adopted and adapted Eastern Mediterranean behaviours and established hierarchical drinking customs, equipment, and self-representation¹⁴.

Slightly later, Greek colonial movements further transmitted and (re)embedded viniculture across southern Italy. Those that settled in this region named it *Oenotria* (Antiochos, *FGrHist* 3.555) due to favourable conditions for grapevines¹⁵. In elite tombs at Archaic Cumae

¹¹ P. McGovern, 2009 cit. n. 5, pp. 187-88; P. McGovern, 2013 cit. n. 2, p. 240; P. McGovern *et al.*, 2013 cit. n. 5, p. 10147.

¹² A. Trentacoste, L. Lodwick cit. n. 6.

¹³ S. Marvelli *et al.*, 2013 cit. n. 6, p. 156 with Fig. 1; P. McGovern, 2013 cit. n. 2, p. 239. Similarly, on the early Phoenician transmission of viniculture to France, see P. McGovern *et al.*, 2013 cit. n. 5.

¹⁴ J.P. Brun, 2004 cit. n. 5, p. 172; L. Motta, K. Beydler, 2020 cit. n. 6, p. 410. See D. Lentjes, G.S. Semerari, 2016 cit. n. 6, pp. 1-2 on how wine and the vine aided social organisation and created increasingly sedentary ancient Mediterranean communities.

¹⁵ J.P. Brun, *Le vin et l'huile dans la Méditerranée antique: Viticulture, oleiculture et procédés de transformation*, 2003, p. 87; J.P. Brun, 2004 cit. n. 5, p. 159. Though it is possible that Bronze Age cultures in Greece preferred a mixed beverage, made from Pramnian wine, honey, barley and topped with cheese, akin to the so-called *kykeon* of Homer (*Iliad* XI.638-41; *Odyssey* X.234; *Homeric Hymn to Demeter* 210; E. Dodd, 2022 cit. n. 6). This may also have been transmitted to Italy via Greek colonisation – graters perhaps for cheese

there are Corinthian A amphorae with associated metal vessels for wine drinking, as well as rock-cut presses on Ischia perhaps also from the Bronze and Early Iron Age¹⁶. Recent archaeological and scientific research has opened the possibility of a third route as early as the Late Bronze Age – a northern overland route via the tributaries of the Danube and Po rivers¹⁷. Archaeobotanical evidence of grapevine cultivation across Italy, likely associated with winemaking, accelerates through the 9th to 7th centuries BCE of the Iron Age¹⁸.

By at least the 7th century BCE, local Italic cultures, notably the Etruscans, mastered viticulture. Tombs in Etruria and Latium (*e.g.* at Vulci and Decima) are filled with amphorae that perhaps contained local wine and vessels in Etruria and the Faliscan region possess religious inscriptions inviting the bearer to drink¹⁹. The production of Italian wine escalates further during the late 6th to 4th centuries BCE – visible via agricultural installations at an Etruscan farm at Podere Tartuchino,

were found in elite tombs at Pithekoussai on the island of Ischia, near Naples (P. McGovern, 2009 cit. n. 5, p. 187). Mixed beverages, including Etruscan and Greek grogs, might, at times, have acted as precursors to pure grape wine.

¹⁶ *E.g.* in the tomb of Pontecagnano 926 (7th century BCE) and Artiaco 104 (late 8th century BCE): J.P. Brun, 2020 cit. n. 1, pp. 8-10). Genomic sequencing of grapevine material also supports links between Greece and, first, southern Italy then, later, central Italy and France, aligned with socioeconomic and historic events regarding Greek colonisation: G. De Lorenzis *et al.*, 2020 cit. n. 6., J.P. Brun, 2004 cit. n. 5, pp. 160-64 and A. Depalmas *et al.*, 2020 cit. n. 7 provide detailed discussion of the evidence from Cumae and Ischia.

¹⁷ A. Pecci *et al.*, 2020 cit. n. 7.

¹⁸ R. Aversano, B. Basile, M. Paolo Buonincontri *et al.*, *Dating the beginning of the Roman viticultural model in the western Mediterranean: The case study of Chianti (central Italy)*, «PloS ONE», 12 (11) (2017), p. 1; S. Marvelli *et al.*, 2013 cit. n. 6, p. 160; L. Motta, K. Beydler, 2020 cit. n. 6, p. 406.

¹⁹ J.P. Brun, 2004 cit. n. 5, p. 172; P. Komar, *Eastern wines on western tables. Consumption, trade and economy in ancient Italy*, 2020, pp. 40-42.

at Fontanile del Sambuca, Poggio Tondo, Pian d'Alma, and perhaps also Oliovitolo near Taranto (Fig. 1)²⁰. This evidence coalesces with that of industrial local production for ceramic wine amphorae as early as the 7th century BCE, including exported wine to Sardinia, Iberia, and Gaul in the 6th to 5th centuries²¹. Local expertise, combined with continual Phoenician and Greek influence, entrenched winemaking in what would become Roman culture.

²⁰ J.P. Brun, 2004 cit. n. 5, pp. 172-73; P. Perkins, I. Attolini, *An Etruscan farm at Podere Tartuchino*, «PBSR», 60 (1992), pp. 71-134; A. Trentacoste, L. Lodwick cit. n. 6. Oliovitolo is attributed as an olive oil processing centre, but the published material culture does not satisfactorily remove the possibility of an association with viticulture. Also see G. Cifani, *Osservazioni sui paesaggi agrari, espropri e colonizzazione nella prima età repubblicana*, in A. Bertrand, *Expropriations et confiscations en Italie et dans les provinces: la colonisation sous la République et l'Empire*, MEFRA, 127.2 (2015), pp. 429-37 for 6th c. BCE press installations attributed to olive oil, which could equally be multi-purpose for oil and wine throughout the annual agricultural cycle (an argument perhaps strengthened considering the often-biennial nature of olive production). See J.P. Brun, 2004 cit. n. 5, pp. 164-66 for transmission of Greek vine types and strengthening production at colonial sites from the early 5th c. BCE. R. Aversano *et al.*, 2017 cit. n. 18 provide morphometric and DNA analyses on grape seeds from Cetamura in Chianti, Etruria, which illustrate changing cultivation and viticultural strategy at the crucial period of Etruscan to Roman cultural dominance (c. 300 BCE-100 CE); namely, changes in vineyard management rather than selection and introduction of new vine varieties. D.L. Thurmond, *From vines to wines in Classical Rome: A handbook of viticulture and oenology in Rome and the Roman West*, 2017, pp. 22-33 summarises that winemaking was systematised and commercialised by interplay between native and immigrant populations, though somewhat downplays local expertise of which we now possess a clearer evidentiary base.

²¹ *E.g.* at Sant'Antonio-Marsiliana d'Albegna: J.P. Brun, 2004 cit. n. 5, p. 172; A. Zifferero, G. Pieragnoli, C. Sanchirico *et al.*, *Un sito artigianale con anfore da trasporto tipo Py 3B a Marsiliana d'Albegna (Manciano, GR)*, «Officina Etruscologia. Semestrale d'archeologia (I mestieri del fuoco)», 1 (2009), pp. 101-26.

3. Vine cultivation and the harvest

It is often difficult to see ancient viticulture in the archaeological record. This contrasts with ancient literature, predominantly Roman agricultural treatises, which provide a rich source of information on the entire cultivation lifecycle, including determining areas suitable for vines; preparing fields and soil for vines; propagating, grafting and planting; caring for, pruning and maintaining vineyards; and the harvest, including how many workers, what tools and the exact activities that occur²².

Pompeii has revealed many clues of Roman viticultural activity. Over a number of years, Jashemski and her team uncovered areas within the city walls that were planted with vines – perhaps best known is the so-called Foro Boario (insula II.5)²³. Due to their burial by volcanic material from Vesuvius, vineyard layouts were remarkably well preserved and, in a similar manner to the human bodies of Pompeii, reconstructed using plaster casts²⁴. This allowed researchers to compare archaeological material with descriptions by ancient writers. Soil, topography, drainage, spacing between vines, interplanting of fruit trees,

²² See E. Dodd, *Roman and Late Antique wine production in the eastern Mediterranean*, 2020, pp. 17-22 for an overview of relevant ancient literature.

²³ P. Boissinot, *Les vignobles des environs de Mégara Hyblaea et les traces de la viticulture italienne Durant l'Antiquité*, «MEFRA», 121 (1) (2009), pp. 111-13; W. Jashemski, *Excavations in the "Foro Boario" at Pompeii: A preliminary report*, «AJA», 72.1 (1968), pp. 69-73; W. Jashemski, *Large vineyard discovered in ancient Pompeii*, «Science», 180 (4088) (1973), pp. 821-30; W. Jashemski, *The discovery of a large vineyard at Pompeii: University of Maryland excavations, 1970*, «AJA», 77 (1) (1973), pp. 27-41; W. Jashemski, *The gardens of Pompeii: An interim report*, «Cronache Pompeiane», 1 (1975), pp. 53-63. Other evidence exists at the *Caupona of Euxinus* (I.6), *House of the Ship Europa* (I.15), *House of the Gladiator* (I.20), *Gardens of the Fugitives* (I.21) and *Hercules* (II.8), and at insulae II.2 and II.7. See E. Dodd, 2022 cit. n. 6, pp. 451-52 for a recent example nearby at Scafati.

²⁴ W. Jashemski, 1973 cit. n. 23; 1975 cit. n. 23, p. 59.

methods of vine training, and use of stakes, trellises and pathways all agreed to varying extents with descriptions by the Roman agricultural writers²⁵. In effect, longstanding hypothetical reconstruction via literature was ground-truthed.

Across the Italian peninsular traces of ancient viticulture and associated hydrological features have also been detected through excavation and survey. Vineyard trenches from the 6th-5th centuries BCE were found near Centocelle, with other early examples at Fontanile del Sambuca in Blera (Lazio), Taranto (Apulia), and Aquarossa and San Giovenale in Etruria (Fig. 1)²⁶. Later trenches, some from the Imperial era, were located at Masseria Martelli and Troia Nord near Lucera (Apulia); Pannaconi near Vibo Valentia (Calabria); Tor di Mezzavia, Osteria delle Capannacce, Ponte di Nona, Casal Bianco, and Tor Pagnotta just outside Rome, and Musarna (Lazio); and Falciano del Massico (Campania)²⁷. Such trenches were historically interpreted as ‘canali’, perhaps

²⁵ E.g. the varying Roman methods of vine training illustrated by W. Jashemski, ‘The discovery of a large vineyard’, 1973 cit. n. 23, p. 34 with ill. 3. On trellising here and at the nearby Villa Regina, see J.P. Brun, 2003 cit. n. 15, p. 38.

²⁶ P. Boissinot, 2009 cit. n. 23; J.P. Brun, 2004 cit. n. 5, p. 177; R. Volpe, *Il suburbia*, In A. Giardina, *Roma antica*, 2000, pp. 183-210; R. Volpe, *Lo sfruttamento agricolo e le costruzioni sul pianoro di Centocelle in età Repubblicana*, in P. Gioia, R. Volpe, *Centocelle I. Roma S.D.O. Le indagini archeologiche*, 2004, pp. 447-61; R. Volpe, 2009 cit. n. 3. There are also many suggestive parallel trenches throughout necropoleis around Paestum in Campania: P. Boissinot, 2009 cit. n. 23, pp. 109-11. Further afield, a range of vineyard trenches are known at Megara Hyblaea, in Sicily, by farmers with small plots of land and likely post-6th c. BCE: P. Boissinot, 2009 cit. n. 23; J.P. Brun, 2004 cit. n. 5, p. 165 and 172. An enclosure farm near Luceria (Apulia), perhaps 2nd c. BCE, also appears to have an adjacent vineyard amongst mixed economy: J. Rossiter, *Roman farm buildings in Italy*, BAR Supp. 52, 1978, pp. 5-6.

²⁷ P. Arthur, *Romans in northern Campania*, Archaeological Monographs of the British School at Rome 1, 1991, pp. 76-77; P. Boissinot, 2009 cit.

for drainage, though recent interpretation suggests use for vines. Their dimensions are highly variable across Italy²⁸. The concentration in the *suburbium* of Rome appear as parallel trenches dug into soft tufa below the soil, typically 0.8-0.9 m wide with spaces of 2.5 m between and a relatively square profile²⁹. Narrower trenches with a concave profile are instead identified as channels for water, used for both irrigation and drainage, and closely connected to those for vines³⁰. All except one are dated to the Republican period³¹. Most of these trenches are found to the east of Rome reflecting the suitability of this region for the vine, as opposed to that on the right bank of the Tiber where almost none are found (though excavation bias must be noted)³². It seems that in the Roman Republican period the *suburbium* was characterised by cultivation of the vine, probably for consumption in local towns and the city, interplanted with other fruits, vegetables, wheat and legumes³³. Nota-

n. 23, p. 106, 108, 114 and 118; J.P. Brun, *Archéologie du vin et de l'huile dans l'Empire romain*, 2004, pp. 28-33; See R. Volpe, 2009 cit. n. 3, table 1 for a comprehensive listing of vineyard traces in the Roman *suburbium*. P. Boissinot, 2009 cit. n. 23, p. 84 provides a detailed description of different types of agricultural excavation in antiquity and how this is depicted within the archaeology, as well as an illustrated overview of all available evidence in Italy (p. 100 with fig. 10).

²⁸ Compare dimensions reported throughout P. Boissinot, 2009 cit. n. 23, and a number in P. Arthur, 1991 cit. n. 27, pp. 76-77 with n. 133.

²⁹ Those nearby Megara Hyblaea also have a square profile and are similarly interpreted as vine trenches: P. Boissinot, 2009 cit. n. 23, pp. 88-91.

³⁰ R. Volpe, 2009 cit. n. 3, p. 371.

³¹ P. Boissinot, 2009 cit. n. 23, pp. 116-17.

³² R. Volpe, 2009 cit. n. 3, p. 371.

³³ P. Boissinot, 2009 cit. n. 23, p. 115; A. Marzano, 2013 cit. n. 3; R. Volpe, 2009 cit. n. 3, pp. 371-77 and 380. Little evidence exists for *amphorae* or ceramic containers produced nearby Rome to store and transport wine from suburbs to the city, which leads archaeologists to conclude that perishable containers, such as animal skins or *cullei*, were used: A. Marzano, 2013

bly, literary sources from the Republic make no mention of viticulture around Rome³⁴. Archaeological evidence, therefore, plays a crucial role to fill *lacunae* in our understanding of local productive topography.

Various tools used in cultivation and the harvest, with parallels in Roman literature, have also been unearthed and provide a tangible glimpse into the daily life and practice of a vineyard worker. Most importantly, the handheld *falx vinitoria* was a multipurpose curved blade used specifically for pruning and other viticultural activities (together with the smaller *falcula* for picking grape bunches)³⁵. It had a paring edge, pointed projection for gouging and hollowing bark, and a tiny axe blade attached to the back³⁶. Along with the usual type, like those found at Grotta di Malconsiglio³⁷ (near Sybaris, Calabria) and Ben-

cit. n. 3, p. 88; R. Volpe, 2009 cit. n. 3, pp. 379-81 and 390). Methods of polycultural cultivation, including the *arbustum* technique where vines are interplanted with and encouraged to climb trees, are well represented in ancient Roman texts and archaeology: J.P. Brun, 2003 cit. n. 15, p. 36; D. Van Limbergen, *Vinum picenum and oliva picena II: Further thoughts on wine and oil presses in central Adriatic Italy*, «Babesch» 94 (2019), p. 117; D. Van Limbergen, P. Monsieur, F. Vermeulen, *The role of overseas export and local consumption demand in the development of viticulture in central Adriatic Italy (200 BC – AD 150). The case of the Ager Potentinus and the wider Potenza valley*, in G. Tol, T. De Haas, *The economic integration of Roman Italy: Rural communities in a globalising world*, 2017, pp. 342-66.

³⁴ E.g. Varro only mentions the cultivation of fruit, vegetables, poultry and eggs: R. Volpe, 2009 cit. n. 3, p. 384.

³⁵ R. Billiard, *La vigne dans l'Antiquité*, 1913, pp. 349-52; J.P. Brun, 2004 cit. n. 5, p. 26; K.D. White, *Agricultural implements of the Roman world*, 2010 (reissue from 1967), pp. 93-97.

³⁶ A.G. Brown, I. Meadows, S.D. Turner *et al.*, *Roman vineyards in Britain: Stratigraphic and palynological data from Wollaston in the Nene Valley, England*, «Antiquity», 75 (2001), p. 753. See the illustrations in R. Billiard, 1913 cit. n. 35, p. 349; J.P. Brun, 2003 cit. n. 15, p. 41.

³⁷ J.P. Brun, 2004 cit. n. 27, p. 32.

evento (Campania), a diverse range of sickle and hook-shaped tools were realistically used across the Roman world for viticultural activities³⁸. Such tools were common for agricultural work in Italy until recently, and still are in some areas³⁹. Indeed, the introduction of regular pruning and vineyard management represents one of the most important innovations in Roman viticulture, leading to larger berries and better yields⁴⁰.

Representations in mosaic, fresco and relief also provide an important archaeological and artistic source, particularly to observe aspects of cultivation, harvest, and the vintage, reflective of the world in which these people lived. A relief on a curved well coping now at Villa Albani in Rome depicts workers carrying baskets of grapes to a shallow basin where they are trod by men holding each other (so as not to slip), with details of a mechanical winch press in the background and a juglet and *dolium* for fermentation.⁴¹ A similar harvest and treading representation appears on the sarcophagus of Annia Faustina⁴². Originally from

³⁸ *E.g.* the range held in the British Museum collection, see A.G. Brown *et al.*, 2001 cit. n. 36, p. 753; W.H. Manning, *Catalogue of the Romano-British iron tools, fittings and weapons in the British Museum*, 1985. Early examples from the Iron Age and Archaic era have also been recovered, including very early 7th-6th c. BCE examples from Punta Charito (Ischia) perhaps belonging to a Greek settler: G. Bartoloni, *Le urne a capanna rinvenute in Italia*, 1987; P. Boissinot, 2009 cit. n. 23, p. 111.

³⁹ A *falcula* found in a Sicilian flea market was used in an experimental archaeological study to recreate Roman wine: M. Indelicato, D. Malfiana, G. Cacciaguerra, *The archaeology of wine in Italy: A Sicilian experiment*, in R. Alonso, J. Baena, D. Canales, *Playing with the time. Experimental archaeology and the study of the past*, 2017, p. 323. K.D. White, 2010 cit. n. 35, p. 185 comments that a Roman example from Benevento is identical to that used by contemporary Italian vine-dressers.

⁴⁰ R. Aversano *et al.*, 2017 cit. n. 18, p. 11; Pliny, *HN* 14.14.

⁴¹ J.P. Brun, 2003 cit. n. 15, pp. 211-12.

⁴² R. Billiard, 1913 cit. n. 35, p. 164.

Prati in Rome, now in the Centrale Montemartini museum, a late 3rd century CE sarcophagus illustrates a mythical *vendemmia* festival and shows every aspect of wine production from harvest to treading. Here, cherubs climb ladders to reach grapes from vines trained high into trees – further evidence of the *arbustum* technique. At Minturnae (Lazio), a mosaic in the imperial baths portrays winged cherubs picking grapes from vines, pouring them from baskets into a brick basin and must flowing into *dolia*. Representations like these work in tandem with survey, excavation, scientific, and historical data to provide a well-rounded comprehension of Roman viti- and viniculture.

4. Winemaking

Winemaking was a well-developed technical process with several production techniques in use by the time it was transferred to Italy and, later, Rome. From at least the Early Republican era, these were developed further, creating increasingly diverse quantities, qualities, and types of wine⁴³. Indeed, the varying complexity of viticultural production processes, in time, knowledge and resources required, naturally lent towards the creation of socially stratified products and qualitative differences⁴⁴.

4.1 Treading

Treading floors (*calçatoria*) or vats are perhaps the quintessential piece of archaeological evidence signifying Roman wine production.

⁴³ Seen already by the 3rd-2nd c. BCE through Cato (*Agr.* 24, 104-25), who includes recipes for making various types of wine, as well as Pliny (throughout Book 14) and Columella's (*Rust.* 12.27, 12.37-12.42) extensive discussion of various wine types in the 1st c. CE.

⁴⁴ See A. Van Oyen, *The moral architecture of villa storage in Italy in the 1st c. B.C.*, «JRA», 28 (2015), p. 117.

Fundamentally unnecessary in the production of olive oil, the presence of a treading floor or basin distinguishes between two processes often difficult to tell apart. Up to 80% of the juice can be extracted by treading, which created the second highest quality wine⁴⁵. Examples of such floors abound across Italy, from Imperial contexts like Villa Magna near Anagni, elite *villae rusticae* around Boscoreale in Campania, to those producing on a smaller scale for local demand, like the small insula I.20 treading floor within the walls of Pompeii that flows into a single *dolium*⁴⁶. Others of varying size have been located on the Adriatic coastline at Tortoreto Muracche, Colombara di Acqualagna, and perhaps Fontanelle di Monsampolo del Tronto; San Giustino at Colle Plinio (Umbria); Settefinestre (Tuscany); just outside Rome at Guidonia, Via Nomentana (near S. Alessandro), Via Tiberina and Via Gabinia, and at Villa Magna, Fosso di Montegiardino, and nearby Nemi (Lazio); Villa Columbrella near Mondragone, Villa Carmiano/Gragnano at Stabiae and Somma Vesuviana (Campania); Grotta del Malconsiglio and perhaps the tanks and pavements at Pannaconi (Calabria), and possibly also at Villa Russi and Bologna (Emilia-Romagna) (see Fig. 2)⁴⁷. It is possible to infer that small-

⁴⁵ E. Dodd, 2020 cit. n. 22, p. 55; E. Dodd, 2022 cit. n. 6; D.L. Thurmond, 2017 cit. n. 20, p. 25; D. Van Limbergen, *Wine, Greek and Roman*, in *Oxford Classical Dictionary*, 2020, accessed online 5/5/21. doi: <https://doi.org/10.1093/acrefore/9780199381135.013.6888>.

⁴⁶ E. Dodd, *Pressing issues: A new discovery in the vineyard of region I.20, Pompeii*, «Archaeologia Classica», 68 (2017), pp. 577-88. Other small treading floors exist within the urban fabric of Pompeii, at II.9.6 (House of the Summer Triclinium), II.1.8-9 (House of Felix & Sabinus), and V.4.6-8 probably producing for local demand and to be sold at taverns.

⁴⁷ M.E. Blake, *The pavements of the Roman buildings of the Republic and early Empire*, «MAAR», 8 (1930), pp. 149-50; L. Ruggini, *Economia e società nell'Italia Annonaria*, 1961, pp. 530-33; E. Ciafardini, *Un complesso produttivo nell'ager Falernus: Contestualizzazione e nuovi dati archeologici*, «OTIVM:

er operations used portable basins made from organic materials of which nothing remains in the archaeological record.⁴⁸ The quantity of treading facilities visible today, therefore, provides a skewed representation (both socioeconomically and quantitatively) and is likely considerably fewer than the reality.

Treading floors could be used alone, as at Pompeii, with a mechanical press in the same physical space, like the now-reconstructed Villa dei Misteri (Fig. 3a), or with the two processes entirely separate (see the Late Republican villa at Tortoreto Muracche). At Villa Magna, the sole use of a large treading area within an Imperial estate may signify

Archeologia e cultura del mondo antico» 4 (2018), p. 1–27; P. Ducati, *Storia di Bologna* 1, 1974, p. 422–23; G. Susini (ed.), *Russi: La villa Romana, la città*, 1975; J. Rossiter, 1978 cit. n. 26, pp. 29–33 and 52; J.P. Brun, 2004 cit. n. 27, p. 11, 32–33, 38–42, 48–49; A. Marzano, *Roman villas in central Italy: A social and economic history*, 2007, p. 106, 110–12, 737; E. Fentress, M. Maiuro, *Villa Magna near Anagni: The emperor, his winery and the wine of Signia*, «JRA», 24 (2011), pp. 351–52; D. Van Limbergen, *Vinum Picenum and Oliva Picena. Wine and oil presses in central Adriatic Italy between the Late Republic and the Early Empire: Evidence and problems*, «Babesch», 86 (2011), p. 78; D. Van Limbergen, 2019 cit. n. 33, p. 113; M. Aoyagi, A. De Simone, G.F. De Simone, *The “Villa of Augustus” at Somma Vesuviana*, in A. Marzano, G. Métraux, *The Roman Villa in the Mediterranean Basin: Late Republic to Late Antiquity*, 2018, pp. 147–48. Also see the catalogues of E. De Sena, 2005 cit. n. 3, pp. 144–47; J. Rossiter, *Wine and oil processing at Roman farms in Italy*, «Phoenix», 35 (4) (1981), pp. 360–61. In central Adriatic Italy, perhaps also at Fermignano San Giacomo Sant’Ippolito di Fano: D. Van Limbergen, 2019 cit. n. 33, p. 113. Within ancient Latium, examples of Imperial-era processing facilities for wine, likely with treading floors, exist at the villas of Castel Giubileo, Monte Canino, Tor Bella Monaca, L. Coelius Nicephorus on the Via Aurelia and Via Prenestina at Casal Bertone near Rome, *Volusii* at Lucus Feroniae, Via Flaminia, and Grotte di Cervara: J.P. Brun, 2004 cit. n. 27, pp. 10–11 with references; E. De Sena, 2005 cit. n. 3, pp. 145–46.

⁴⁸ J.P. Brun, 2020 cit. n. 1; A. Marzano, 2013 cit. n. 3, p. 101; J. Rossiter, 1981 cit. n. 47, p. 348; D. Van Limbergen, 2011 cit. n. 47, p. 81.

high quality production and, when combined with literary evidence, possibly also ritual, theatrical or performative elements⁴⁹.

Mention must also be given to rock-cut treading areas, or *palmenti*, with adjoining vats, either singular or multiple, for collection, decantation and fermentation of wine. While these are common on Sicily and Ischia, new research is recognising and analysing examples across peninsular Italy at sites like San Biagio a Castel del Piano, San Sepolcro, Monte Amiata, Seggiano and Vitozza (Tuscany); San Leo (Marche); Allumiere, Tolfa, Manziana and Norchia (Lazio); Serramezzana and Novi Velia (Campania); and Ferruzzano and Bruzzano (Calabria) (Fig. 2)⁵⁰. They can be quadrangular or (more rarely) circular in shape, of various sizes and arrangements, and are typically located nearby water sources, on elevated ground, and with vineyards surrounding⁵¹. Such features regularly lack clear dating material and have variously been attributed to the Archaic, Roman, Late Antique, Medieval and pre-industrial eras; however, reinvigorated study using scientific methodologies is proving ef-

⁴⁹ E. Fentress, M. Maiuro, 2011 cit. n. 47. See N. Purcell, *The Roman villa and the landscape of production*, in T. Cornell, K. Lomas, *Urban society in Roman Italy*, 1995, p. 170 for examples of production as spectacle, and more recently with new evidence from the Villa of the Quintilii just outside Rome in E. Dodd, G. Galli, R. Frontoni, *The spectacle of production: a Roman imperial winery at the Villa of the Quintilii, Rome*, «Antiquity», (97) (392) (2023): pp. 436-453. <https://doi.org/10.15184/aqy.2023.18>

⁵⁰ A. Ciacci, P. Rendini, A. Zifferero, *Archeologia della vite e del vino in Toscana e nel Lazio: Dalle tecniche dell'indagine archeologica alle prospettive della biologia molecolare*, 2012, pp. 531-79. See map in G. Olcese, A. Razza, M. Michele Surace, *Ricerche multidisciplinari sui palmenti rupestri nell'Italia meridionale tirrenica*, in J.P. Brun, N. Garnier, G. Olcese, *Making wine in western-Mediterranean. Production and the trade of amphorae: Some new data from Italy. Panel 3.5. Archaeology and Economy in the Ancient World 9*, 2020, pp. 31-41.

⁵¹ G. Olcese *et al.*, 2020 cit. n. 50, pp. 34-35.

fective at providing more detailed answers regarding topography, structure, chronology and use⁵².

4.2 Pressing

Harvested grapes were trod twice through before the remaining pomace/marc was placed in baskets made of loosely woven rushes, wound rope, cloth, or in a wooden box for mechanical pressing⁵³. This mechanical process produced progressively lower qualities of wine – from the first (deemed similar to trod must), through the second (so-called *mustum tortivum* or *circumsicium*, often used in medicine), to the third and fourth (Latin: *lora*; Greek: *deuterius*; Hebrew: *tmd*)⁵⁴. Even lower qualities involved soaking remaining pulp in water and pressing the re-hydrated substance to produce a cheap ‘after-wine’ for workmen and lower classes⁵⁵.

The presence of a mechanical press indicates winemaking for a distinct scale or purpose and is traditionally thought to evidence surplus production and/or a degree of investment⁵⁶. Wine can, after all, be made

⁵² Some on Sicily appear to be pre-Imperial in date (perhaps Punic-Hellenistic), abandoned during the Imperial era, but reused again from the Byzantine period: G. Olcese *et al.*, 2020 cit. n. 50, pp. 37-39.

⁵³ E. Dodd, 2020 cit. n. 22, p. 55; Columella *Rust.* 12.39.3-4.

⁵⁴ E. Dodd, 2020 cit. n. 22, p. 56; R. Frankel, *Wine and oil production in antiquity in Israel and other Mediterranean countries*, 1999, p. 42.

⁵⁵ E. Dodd, 2020 cit. n. 22, p. 56; R.J. Forbes, *Food and drink*, in C. Singer, E.J. Holmyard, A.R. Hall *et al.*, *A history of technology*, vol. II: *The Mediterranean Civilizations and the Middle Ages c. 700 B.C. to c. A.D. 1500*, 1956, p. 132; R. Frankel, 1999 cit. n. 54, pp. 42-43; Cato *Agr.* 25.1; Varro *Rust.* 1.54.3; *Geoponika* 6.13.

⁵⁶ T. Lewit, *Oil and wine press technology in its economic context: Screw presses, the rural economy and trade in Late Antiquity*, «Antiquité Tardive», 20 (2012), p. 132; T. Lewit, “*Terris, vineis, olivetis...*”: *Wine and oil production after the villas*’, «European Journal of Postclassical Archaeologies», 10 (2020), pp. 195-

simply by treading grapes with little technological involvement. Yet across the Mediterranean, presses vary greatly in size, complexity, and technology – all of which influence the required expertise, investment, labour and, subsequently, impact the production purpose or scale.

Italy possessed a rather distinct mechanical press tradition throughout antiquity, one that finds echoes in France, Spain and Istria/Dalmatia but little elsewhere in the Mediterranean⁵⁷. The architecture and flooring of press rooms in Italy typically uses either *cocciopesto* (waterproof plaster) or *opus spicatum* (herringbone brickwork) – or both – with the latter more common among installations in central and northern Italy (though this is by no means a rule). During the Mid-Republican era somewhat of a ‘press revolution’ took place – the result of centuries of viticultural evolution and maturation within Italy. This was spurred by favourable socioeconomic conditions, agricultural expansion and is reflected in Cato’s text. It is here for the first time that we find colossal lever presses installed in villas, with powerful winches

96 and 213; A. Marzano, 2013 cit. n. 3, pp. 92-93; J. Rossiter, 1981 cit. n. 47, p. 348; D. Van Limbergen, 2011 cit. n. 47, p. 81.

⁵⁷ Press technologies were highly (micro)regionalised throughout the ancient Mediterranean – broad-stroke technological development and uptake rarely occurred. Instead, centuries old presses were used alongside new technologies and choice depended upon a range of individualised criteria unique to each producer’s situation: T. Lewit, P. Burton, *Wine and oil presses in the Roman to Late Antique Near East and Mediterranean: Balancing textual and archaeological evidence*, in A. Squitieri, D. Eitam, *Stone tools in the ancient Near East and Egypt. Ground stone tools, rock-cut installations and stone vessels from Prehistory to Late Antiquity*, 2019, p. 106; T. Lewit, *Invention, tinkering, or transfer? Innovation in oil and wine presses in the Roman Empire*, in P. Erdkamp, K. Verboven, A. Zuiderhoek, *Capital, investment, and innovation in the Roman world*, 2020, pp. 314-15 and 322; E. Dodd, 2020 cit. n. 22, p. 108 with n. 804; E. Dodd, *Wine and olive oil across the ancient Cyclades: A preliminary report and new thoughts on the development of Greek and Roman press technology*, «Meditarch», 32/33 (2020), pp. 132-33.

and heavy masonry, of a size not yet seen even in the well-established winemaking cultures further east⁵⁸.

In Italy, these presses form two broadly defined types – though there is great variation within these broader groups, further complicated by an apparent lack of microregional trends. Detailed chronologies also present difficulties when associated with type and are in need of more detailed study, which will form a crucial future research direction. Both can be used for other commodities (*e.g.* pressing olives to produce oil), so, unless ambiguity is specified, only those with adequately certain vinicultural attribution are listed below.

The first type is best illustrated by the elite agricultural villas of Campania, previously termed the ‘platform press’, though one which now finds similarities in other Italian regions⁵⁹. It characteristically has a lever-and-drum mechanism directly anchored into the ground, lowered by a winch and handspikes (*sucula*) and pressing over a platform that is often also used for treading (see Fig. 3a). Archaeologically visible are usually two square holes to hold the vertical wooden beams (*stipites*) supporting the winch mechanism, and one hole at the rear of the press for an upright at the fulcrum end (*arbore*)⁶⁰. Typical examples in Campania are those at villas della Pisanella, Regina, dei Misteri (Fig. 3a), at the so-called Stazione and Giuliana farmhouses in Boscoreale, and Villa C. Olius Ampliatus near Naples and Prato at Sperlonga (Lazio)⁶¹. A rapidly deteriorating wall painting from

⁵⁸ J.P. Brun, 2004 cit. n. 5, p. 182.

⁵⁹ J. Rossiter, 1978 cit. n. 26, pp. 49-55; 1981; R. Frankel, 1999 cit. n. 54, pp. 91-93.

⁶⁰ J. Rossiter, 1978 cit. n. 26, p. 49.

⁶¹ H. Broise, X. Lafon, *La villa Prato de Sperlonga*, 2001; J.P. Brun, 2004 cit. n. 5, pp. 181-83; J.P. Brun, 2004 cit. n. 27, pp. 14-20; J. Rossiter, 1978 cit. n. 26, pp. 18-21. For the Stazione winery at Boscoreale, see R. Frankel, 1999 cit. n. 54, ‘List B’, T980; J. Rossiter, 1978 cit. n. 26, pp. 12-14.

the House of the Vettii (VI.15.1, Pompeii) depicts this mechanism⁶². Elsewhere in Italy, similar lever-and-drum presses might have existed at Ca' Balduini di sopra, Piano della Monaca, and Tortoreto Case Ozzi in the central Adriatic region of Picenum (from 2nd c. BCE onwards)⁶³; Monte Canino, Capena in Lazio⁶⁴; San Giuliano and Villa di Leonessa in Apulia⁶⁵; Ciminata, near Rossano, and Pannaconi, near Vibo Valentia, in Calabria⁶⁶. Other presses of an unidentifiable type exist at the Villa d'Alba Docilia, Albisola (Liguria), and Villas Fiumana (Emilia-Romagna) and Joannis (Friuli) (Fig. 7)⁶⁷. It was previously thought that this type did not survive past the 1st century CE, yet archaeology now shows they undeniably persisted into Late Antiquity⁶⁸. A 4th century CE mosaic at the Roman villa of Piazza Armerina (Sicily) also depicts a lever-and-drum press reinforcing the notion that new screw technologies did not completely take over⁶⁹.

⁶² J.P. Brun, 2003 cit. n. 15, p. 212.

⁶³ D. Van Limbergen, 2019 cit. n. 33, p. 111.

⁶⁴ M. Pallottino, *Capena – resti di costruzioni romane e medioevali in loc. Montecanino*, «Notizie degli Scavi di antichità», 1321 (1937); R. Frankel, 1999 cit. n. 54, 'List A', site 27-0-1241-00-001.

⁶⁵ Both with *cocciopesto* flooring like installations in N Italy and at Francolise in Campania. In Apulia, wine production also likely existed at Villa d'Agnuli: J.P. Brun, 2004 cit. n. 5, pp. 184-85; J.P. Brun, 2004 cit. n. 27, p. 29.

⁶⁶ P. Boissinot, 2009 cit. n. 23, p. 108; J.P. Brun, 2004 cit. n. 27, p. 32. Ciminata has two presses and *opus spicatum* flooring.

⁶⁷ J.P. Brun, 2004 cit. n. 27, pp. 44 and 47.

⁶⁸ P. Burton, T. Lewit, *Pliny's presses: The true story of the first century wine press*, «Klio», 101 (2) (2019), p. 551; T. Lewit, 2012 cit. n. 57, p. 127; T. Lewit, P. Burton, 2019 cit. n. 57, p. 101.

⁶⁹ In contrast to the eastern Mediterranean, where the newer (though not necessarily more efficient) direct-pressure screw presses dominate Late Antique contexts. A 2nd c. CE bas-relief from Villa Rondanini, Rome, depicts a counterweight with exterior dovetail mortises – frequently used in lever-and-drum presses.

A variation on this first type, also found within Campania, uses a lever-and-hanging screw weight, or screw directly attached to the ground, instead of a drum and winch system. This can be seen at the now-reconstructed *Insula II.5* press, Pompeii (though this is debated), a villa near Sessa Aurunca (suggested to belong to Trajan's daughter, Matidia), and possibly the Villa of Publius Fannius Sinistor in Boscoreale⁷⁰.

The second press type typically features a large pressing area of either *coccipesto* or, more commonly, *opus spicatum*, delimited by a circular collection channel and often built into a floor structure of the same material⁷¹. Press apparatuses within this type often utilise a stone pier base with one or two interior mortises, the latter previously called the "Tivoli pier base", to hold the wooden uprights at the fulcrum (*arbores*)⁷². They have been interpreted as lever-and-screw presses, of which two variations exist, reinforced by *in situ* counterweight finds⁷³. Archaeological data, and close comparison to an im-

⁷⁰ J.P. Brun, 2004 cit. n. 27, pp. 13-14, 22-23, 27; W. Jashemski, 1968 cit. n. 23; W. Jashemski, 1973 cit. n. 23; J. Rossiter, 1978 cit. n. 26, p. 33; J. Rossiter, E. Haldenby, *A wine-making plant in Pompeii insula II.5*, «Echos du Monde Classique», 33 (8) (1989), pp. 229-39. The *Insula II.5* press at Pompeii has now been reconstructed with a lever-and-drum mechanism (see E. Dodd, 2022 cit. n. 6, Fig. 10).

⁷¹ Previously termed 'circular bed' presses: J. Rossiter, 1978 cit. n. 26, pp. 49-55; J. Rossiter, 1981 cit. n. 47; R. Frankel, 1999 cit. n. 54, pp. 92-93. A few examples also include flooring of tufa paving or monochrome mosaic, while others have a circular stone press bed or square bed with circular drainage groove (J. Rossiter, 1978 cit. n. 26, pp. 50-52).

⁷² See databases in D. Van Limbergen, 2011 cit. n. 47; 2019 cit. n. 33.

⁷³ D. Van Limbergen, 2019 cit. n. 33, p. 112. Though some may have utilised winch mechanisms, as described above (*e.g.* at Varignano: J.P. Brun, 2004 cit. n. 27, p. 43). Screw counterweights appear in a variety of round, cylindrical and square forms in Italy, using a combination of exterior and interior mortises and sockets. The distribution and chronology of this weight type, called '*Samarina*' by Frankel (1999 cit. n. 54, p. 120), suggests that it

portant passage by Pliny, indicates that one variation lifted a mobile stone counterweight (or -weights), and the other had a screw attached directly to the ground⁷⁴.

This style is found across Italy, though there is a notable concentration in central-northern regions (Fig. 4). Archetypal vinicultural examples have been found at Varignano (Liguria); a number around Verona (Veneto) and Trento (Trentino); Settefinestre and Via della Fattoria near Cosa (Tuscany); Chiarino di Recanati, Colombara di Acqualagna, Monte Torto di Osimo, Cupra Marittima San Basso, and Offida San Giovanni in the central Adriatic region (Marche); Via Nomentana and the Villa dei Gordiani (Lazio); and Scalea (Calabria) (Fig. 7)⁷⁵. There are also suggestive remains elsewhere on the peninsular⁷⁶. A screw-operated press of similar type likely operated at a 2nd-3rd century CE winery on the Via Gabinia just outside of Rome⁷⁷, and archaeobotanical evidence of grape seeds and indications of a press at Via Cavalotti, Seni-

developed in Italy with a range of proto- and sub-types.

⁷⁴ J.P. Brun, 2003 cit. n. 15, pp. 215-16; P. Burton, T. Lewit, 2019 cit. n. 68. It is also possible that the former lifted a box of stones or stones within a wooden frame, acting as a counterweight, which left little trace in the archaeological record.

⁷⁵ G. Pesce, *Scalea: Trovamenti vari*, «Notizie degli Scavi di antichità», 12 (1936), pp. 67-74; J. Rossiter, 1978 cit. n. 26; P. Liverani, *Termini muti di centuriazione o contrapesi di torchi?*, «MEFRA», 99 (1) (1987), pp. 111-27; J.P. Brun, 2004 cit. n. 27, pp. 38-43; E. De Sena, 2005 cit. n. 3, p. 144; A. Marzano, 2007 cit. n. 47, p. 106; D. Van Limbergen, 2019 cit. n. 33, p. 112; A. Van Oyen, 2015 cit. n. 44, pp. 118-19. It remains uncertain whether those at Settefinestre operated by screw or winch. For databases, including less certain vinicultural examples, see J.P. Brun, 2004 cit. n. 27, pp. 34-37; D. Van Limbergen, 2011 cit. n. 47; D. Van Limbergen, 2019 cit. n. 33, p. 106 and 112.

⁷⁶ *E.g.* Valle Pilella (or Pitella) and others in the *Ager Tiburtinus*, stretching northeast of Rome between the Tiber and Aniene rivers (E. De Sena, 2005 cit. n. 3, pp. 145-46), as well as those at the Villa of the Quintilii (E. Dodd, G. Galli, R. Frontoni, 2023 cit. n. 49).

⁷⁷ J.P. Brun, 2004 cit. n. 27, p. 11.

gallia, suggest possible wine production from mid-2nd century BCE to the 1st century CE⁷⁸.

These presses appear from at least the 2nd and certainly 1st century BCE through to the 2nd century CE; though some undoubtedly continue sporadically through the 4th and 5th centuries⁷⁹. Importantly, and in relation to the first style above, it is not necessarily a later type, as proposed previously, and clearly possessed a lengthy use-life – though scaling down in size and function probably occurred through Late Antiquity.

Finally, direct-screw presses were also used in Roman Italy; though these, too, suffer from low survival rates due to use of wooden components and difficulty in identification. It is likely that such mechanisms were preferred in urban environments, where valuable space was limited and could not be given to large lever presses, and within oileries, fulleries and perfumeries. It is, however, almost certain that they were also used for wine production in Italy – after all, they are included within Pliny's description of wine presses⁸⁰.

4.3 Fermentation

Once grapes were trod or pressed, must flowed through channels or pipes with varying degrees of complexity, dependent on the scale of the installation, into one or more collection structures (typically a vat lined with *cocciopesto*, or similar waterproof treatment, or a *dolium*). In more complex installations, intermediate vats collected must, allowed sediment to settle and primary fermentation to begin, before being ladled, decanted or channelled into a *cella vinaria* with multiple *dolia* (*defossa*) for clarification, (often) modification, and fermentation proper (see Figs. 3b)⁸¹.

⁷⁸ D. Van Limbergen 2019 cit. n. 33, pp. 106-8.

⁷⁹ In line with amphora evidence: D. Van Limbergen 2019 cit. n. 33, p. 111 and 116.

⁸⁰ P. Burton, T. Lewit, 2019 cit. n. 68; Pliny, *NH* 18.74.317.

⁸¹ Well known examples need not be repeated and are listed in the catalogues and texts of G. Baratta, *Römische kelteranlagen auf der Italienischen halbinsel*,

Channelling could occur horizontally, with pipes running between multiple rooms in a villa (e.g. Villa dei Misteri at Pompeii), or vertically, with must flowing through a hole in the floor into collection structures below (e.g. Settefinestre). At simple, small-scale installations, like Pompeii I.20, must flowed directly from the treading floor into a single *dolium*⁸². Manual decanting using ceramic or metal jugs also occurred. Some collection vats in central Adriatic Italy include access stairs for cleaning and decantation – an architectural feature mirrored within wineries elsewhere in the Mediterranean (e.g. Delos)⁸³.

The location, design, and scale of *cellae vinariae* and fermentation facilities varied across Roman Italy and was largely dependent on climate, socio-economic status, and purpose. Rows of sunken fermentation *dolia* were housed in the (semi-)open air across Campania and Apulia (Fig. 3b), with its favourable climate, but further north, in Etru-

2005; J.P. Brun, 2003 cit. n. 15; 2004 cit. n. 5; 2004 cit. n. 27; M. Feige, *Landwirtschaftliche produktionsanlagen römischer villen im republikanischen und kaiserzeitlichen Italien*, 2022; J. Rossiter 1978 cit. n. 26; 1981 cit. n. 47; A. Van Oyen, *The socio-economics of Roman storage: Agriculture, trade, and family*, 2020. Less known are a villa store-room with at least 8 sunken *dolia* at Casalotti (Via Boccea), and a pair of *dolia defossa* with channels leading to two large cisterns (c. 102,000 L) at Casilina on the Via Tuscolana, which probably indicate storage for wine (E. De Sena, 2005 cit. n. 3, pp. 144-47; M. Feige, 2022, *ibid.*, Fig. 2; J. Rossiter 1978 cit. n. 26, p. 59). On the various stages and requirements of fermentation, including primary, secondary/malolactic and respective durations in antiquity, as well as clarification, modification and additives, see E. Dodd, 2020 cit. n. 22, pp. 56-59 and 115-16; D. Van Limbergen, 2020 cit. n. 45. C. Cheung, 'Managing food storage in the Roman Empire', «Quaternary International», 597 (2021), pp. 63-75 provides detail on why *dolia* were such suitable vessels and how they aid the fermentation process.

⁸²E. Dodd, 2017 cit. n. 46.

⁸³E. Dodd, 2020 cit. n. 22, pp. 75-103; D. Van Limbergen 2019 cit. n. 33, pp. 109-10.

ria, were located inside large storage structures⁸⁴. In the former, double-layer locking lids were used as protection against the elements and to ensure a stable fermentation environment⁸⁵. At small installations, where there is no sign of *dolia defossa*, fermentation likely occurred within the collection *dolium*/vat or the must decanted relatively quickly into portable *amphorae* and fermented therein – a system used commonly in the eastern Mediterranean.

Features like *dolia* and *cocciopesto*-lined (or even brick, mosaic, lead, or tile) vats, along with counterweights and material culture that indicates pressing, therefore, are key archaeological indicators of vinicultural activity. As with other archaeological evidence, great interpretational care must be taken; such features were also used within oileries, fulleries, aquaculture and other agricultural endeavours. Similarly, organic structures that leave little archaeological trace, like wooden tubs, were almost certainly used in collection and fermentation across antiquity.

5. Storage and transport

The archetypal Roman wine storage and transport containers, *amphorae*, are long studied and form an invaluable component in our multi-disciplinary repertoire to understand Roman wine production⁸⁶. One need only glance at the extensive work of scholars like Tchernia,

⁸⁴J.P. Brun, 2003 cit. n. 15, p. 79; G. Montana, L. Randazzo, D. Barca, M. Carroll, *Archaeometric Analysis of Building Ceramics and “Dolia Defossa” from the Roman Imperial Estate of Vagnari (Gravina in Puglia, Italy)*, «JAS: Reports», 38 (2020), pp. 1-14. Various called ‘sheds’ or ‘hangars’. For discussions of winery storage facilities in Italy, see E. Dodd, 2022 cit. n. 6; A. Van Oyen, 2015 cit. n. 44.

⁸⁵For an excellent description of this system, see C. Cheung, 2021 cit. n. 81, p. 9.

⁸⁶See the excellent introduction and history of amphora studies by the University of Southampton, *Roman amphorae: a digital resource*, 2014 at: https://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/index.cfm.

Carandini, Will, Zevi, Panella, Key and Olcese, among many others, to realise the rich history of *amphora* studies⁸⁷. Wine could be preserved in these ceramic containers for long periods of time, even decades, provided they were hermetically sealed (with resin, pitch, oil, cork, plaster and ceramic)⁸⁸. Yet this, too, is complicated by the multi-purpose use and reuse of these containers. Transport methods using organic containers were also historically underappreciated in scholarship; however, most wine was produced and consumed locally and could be transported and stored for short periods of time in animal hides and small ceramic vessels⁸⁹. Barrels and skins (*cullei*) were crucial in the storage and transport of wine, particularly for certain geographies, purposes, and markets – the former used increasingly in the central and western Mediterranean from the 1st century BCE⁹⁰.

While few examples of these are known archaeologically, Roman art provides glimpses into their appearance and use. A wall painting (now

⁸⁷ Pertinent examples include P. Arthur, *Roman amphorae and the Ager Falernus under the Empire*, «PBSA», 50 (1983), pp. 22-33; A. Carandini, C. Panella, *Ostia III: Le terme del Nuotatore. Scavo dell'ambiente V et di un saggio nell'area*, 1973; J. Lund, *Transport amphorae as evidence of exportation of Italian wine and oil to the eastern Mediterranean in the Hellenistic period*, in J. Lund, *Between Orient and Occident: Studies in honour of P.J. Riis*, 2000, pp. 77-99; C. Panella, A. Tchernia, *Produits agricoles transportés en amphores, in L'Italie d'Auguste à Dioclétien*, 1994, pp. 145-65; D. Peacock, D. Williams, *Amphorae and the Roman economy*, 1986; J.T. Peña, *Roman pottery in the archaeological record*, 2007; A. Tchernia, *Le vin de l'Italie Romaine*, 1986; F. Zevi, *Appunti sulle anfore romane: La tavola tipologica del Dressel*, «Archaeologia Classica», 18 (1966), pp. 208-47. See the thorough bibliography presented by the University of Southampton, 2014 cit. n. 86, under 'References'.

⁸⁸ On sealants, see C. Cheung, 2021 cit. n. 81, p. 9.

⁸⁹ C. Cheung, 2021 cit. n. 81, p. 9.

⁹⁰ J.P. Brun, 2003 cit. n. 15, pp. 100-5; J.P. Brun, 2004 cit. n. 5, pp. 24-25. See Pliny's (*NH* 14.132) commentary on various methods of keeping wine in different climates.

lost) from region VI.10.1 in Pompeii depicts men decanting wine from a *culleus* on a horse-drawn cart into *amphorae*, and a sculpture from the Nymphaeum of Claudius at Baiae shows wine within a smaller animal skin⁹¹. Similar examples survive in bas-relief from Nona on the Via Praenestina, at Minturnae, and one now in the British Museum of an ox-drawn cart and *culleus*. The increasing dominance of the barrel in northern Italian regions distorts our understanding of Imperial Rome's wine trade. The disappearance of certain *amphora* types (as early as the 1st century CE, but certainly by the 2nd) may not illustrate a crisis in viticulture, but rather triumph of the barrel⁹².

6. Conclusion

Much can be added to this chapter, particularly in relation to *amphorae* and ceramic material along with more recent scientific analyses, including geochemical, geophysical, geological and paleoenvironmental studies. Nor has this touched upon types of the grapevine, wine or the innumerable facets of use and purpose (social, economic, cultural, religious, medicinal, etc.). It does, however, make clear that vinicultural archaeology is a field experiencing exponential growth and intensified study, which is simultaneously expanding and fine-tuning comprehension. Wine production in Italy continued to flourish through the 4th and 5th centuries CE, with older press technologies used alongside traditional modes of land exploitation through villas and intensive production⁹³. This does not necessarily appear to be a spatially restricted phenomenon – it occurred from east to west, and north to south. It was not until the 6th century CE that wine production diminished, continuing only on a smaller scale for local and domestic use. The *longue*

⁹¹ J.P. Brun, 2003 cit. n. 15, pp. 101-4.

⁹² J.P. Brun, 2004 cit. n. 27, p. 48.

⁹³ J. Rossiter, 2008 cit. n. 3, pp. 115-16.

durée history of wine production in ancient Italy is thus a diverse story, specific to local geographic, climatic, socio-economic and political environments. In time, our understanding of these invisible periods may be enlightened through new methods and higher resolution archaeology – it is inevitable that our understanding of Roman wine production in Italy will continue to evolve.



Fig. 1 Map of sites mentioned in the text with evidence of pre-Roman or Roman grapevine exploitation or cultivation (map by E. Dodd with base GIS and hillshade data from the EEA and Esri)



Fig. 2 Map of sites mentioned in the text with evidence of treading floor structures or *palmenti* (map by E. Dodd with base GIS and hillshade data from the EEA and Esri)



Fig. 3 (a) reconstructed type 1 Roman wine press with structural elements indicated at the Villa dei Misteri, Pompeii, 1st c. CE (photo by E. Dodd); (b) the semi-open air *cella vinaria* at Villa Regina, Boscoreale. The double-layer locking *dolia* lids are preserved on each *dolium* (photo by E. Dodd)



Fig. 4 Map of sites mentioned in the text with evidence of presses or *cellae vinariae*. Square = press type 1; black circle = press type 2; star = uncertain type; white circle = *cella* (map by E. Dodd with base GIS and hillshade data from the EEA and Esri)