



IX^ Edizione
SUMMER SCHOOL
SANGUIS JOVIS

ARTIFICIALE

Quando la mano dell'uomo migliora la natura

OCRA: Officine Creative dell'Abitare | Via Boldrini 4, Montalcino
Montalcino, 6-10 luglio 2026

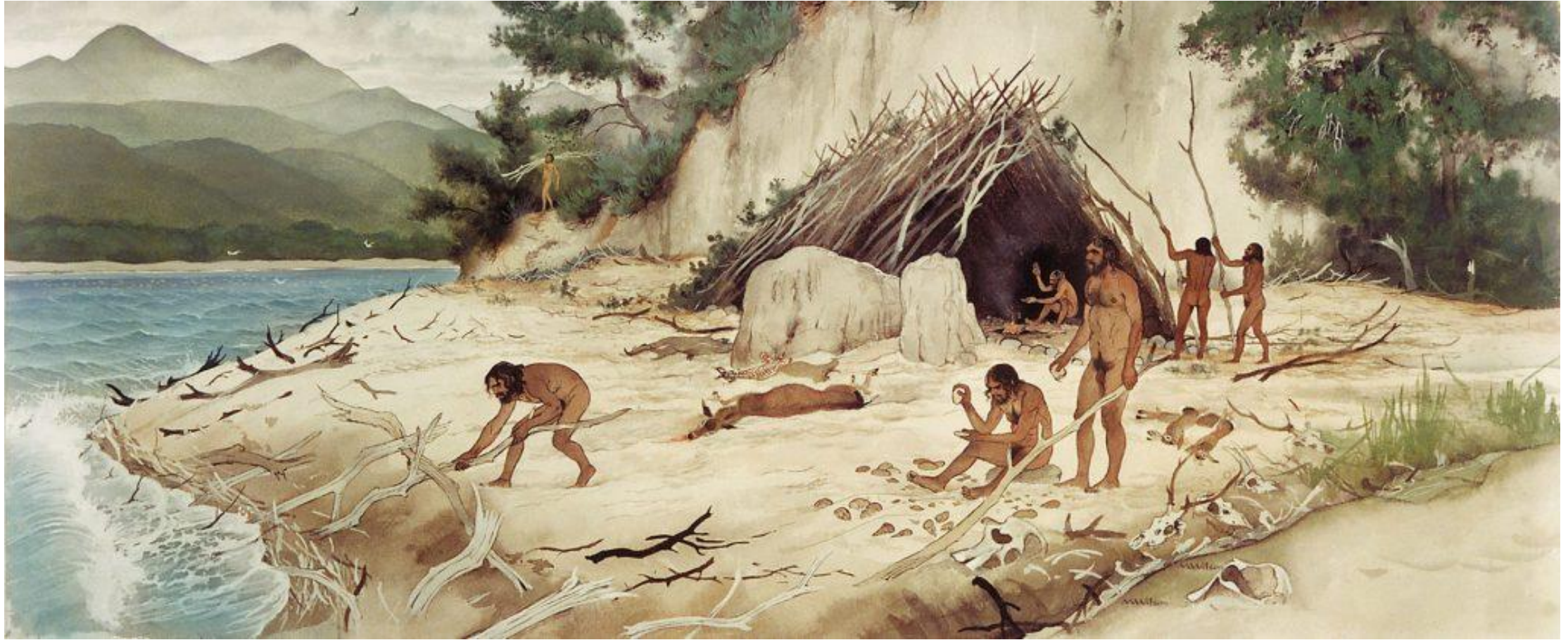


Il primo atto dell'artificiale: la domesticazione della vite selvatica

FRUTTI ZUCCHERINI E GRANDI SCIMMIE ALLE ORIGINI DELLA VITICOLTURA E DELL'ENOLOGIA: IL RUOLO DELLE VITI SELVATICHE NELLA LUNGA STORIA DELLA DOMESTICAZIONE

Osvaldo Failla - Università degli Studi di Milano e Museo di Storia dell'Agricoltura

Pips of wild grapes have been found associated with the Paleolithic hut shelter at Terra Amata, Nice, southern France, dating back some 400,000 years (*Homo erectus*); at the Grotta dell'Uzzo in Sicily, in the Franchthi Cave in Greece, at Tell Abu Hureyra in Syria, at Tell Aswad and at Jericho, all in levels dating between the 12th and 9th millennium bC



Reconstruction of the Terra Amata site, 400,000 years ago. *Homo erectus*.
Credit: M. Wilson / City of Nice.



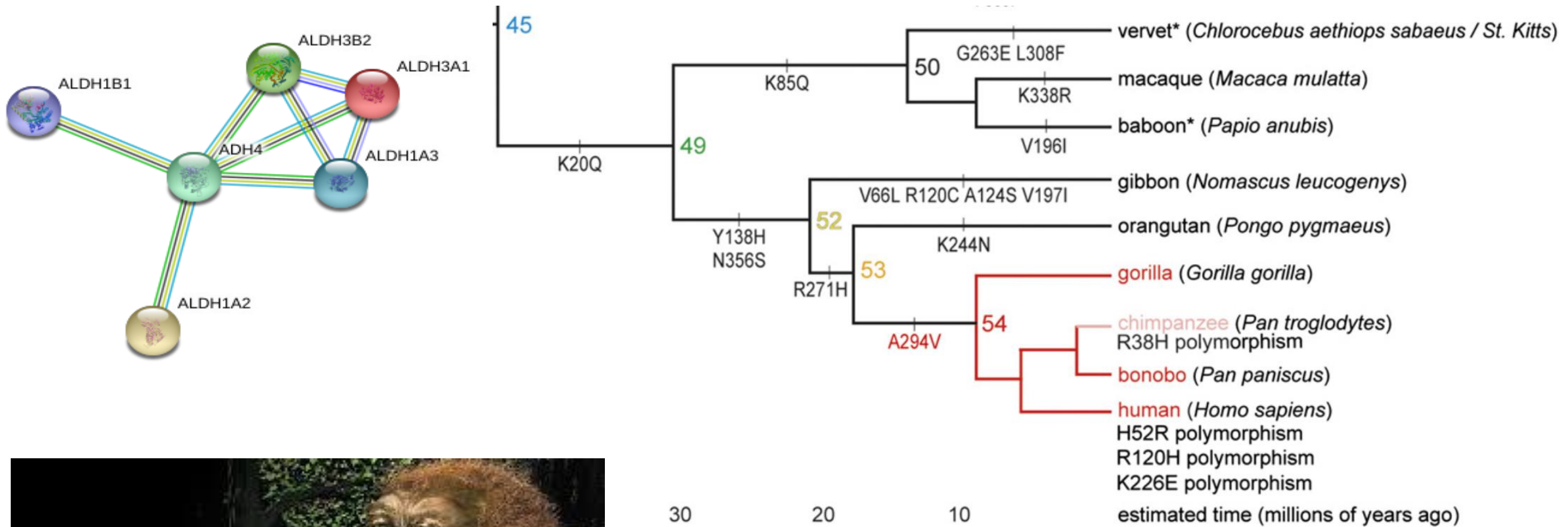
Robert Dudley
University of California at Berkeley

Dudley, R. Evolutionary Origins of Human Alcoholism in Primate Frugivory. *Q. Rev. Biol.* **2000**, 75, 3–15.

Dudley, R. *The Drunken Monkey: Why We Drink and Abuse Alcohol*; University of California Press: Berkeley, CA, USA, **2014**.



ADH4: a history of 13-21 million years ago



ADH4 is able to oxidize ethanol 40-fold better than the enzyme at node 53



Maro A., Byrne LC, Namaganda S, Dudley R. **2026**. Urinary concentrations of a direct ethanol metabolite indicate substantial ingestion of fermenting fruit by chimpanzees. *Biol. Lett.* 22: 20250740.

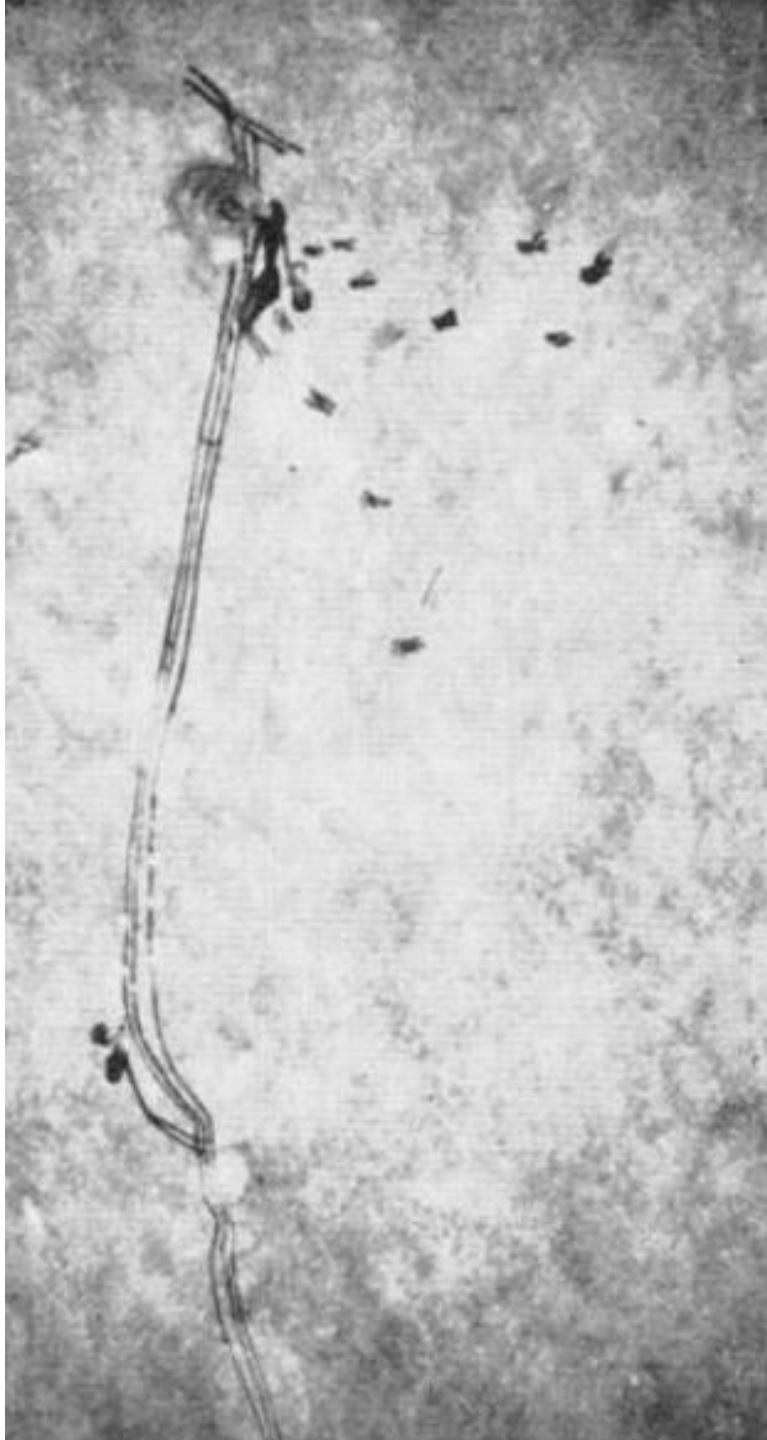


Laussel Venus, Upper Paleolithic (25.000 yrs BCE) Bas-Relief, Aquitaine Museum, Bordeaux, France.

Apic / Hulton Archive / Getty Images



VADO ALL'ARANCIO (Massa Marittima – Tuscany, > 10000 yrs BCE)



Cave drawing: honey harvesting scene.
Cueva de la Araña cave (Spain) (ca. 7000 BC).

Sorb tree



crab apple



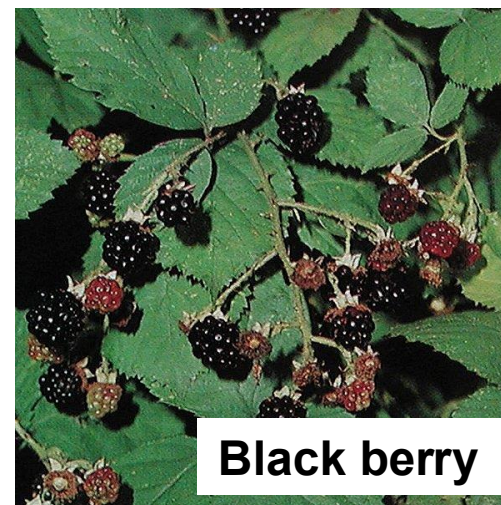
Cornelian cherry



Raspberry



Wild grapes



Black berry



Elder berry



Honeyberry tree

Middle-Late Bronze Age (1650–1200 BC)

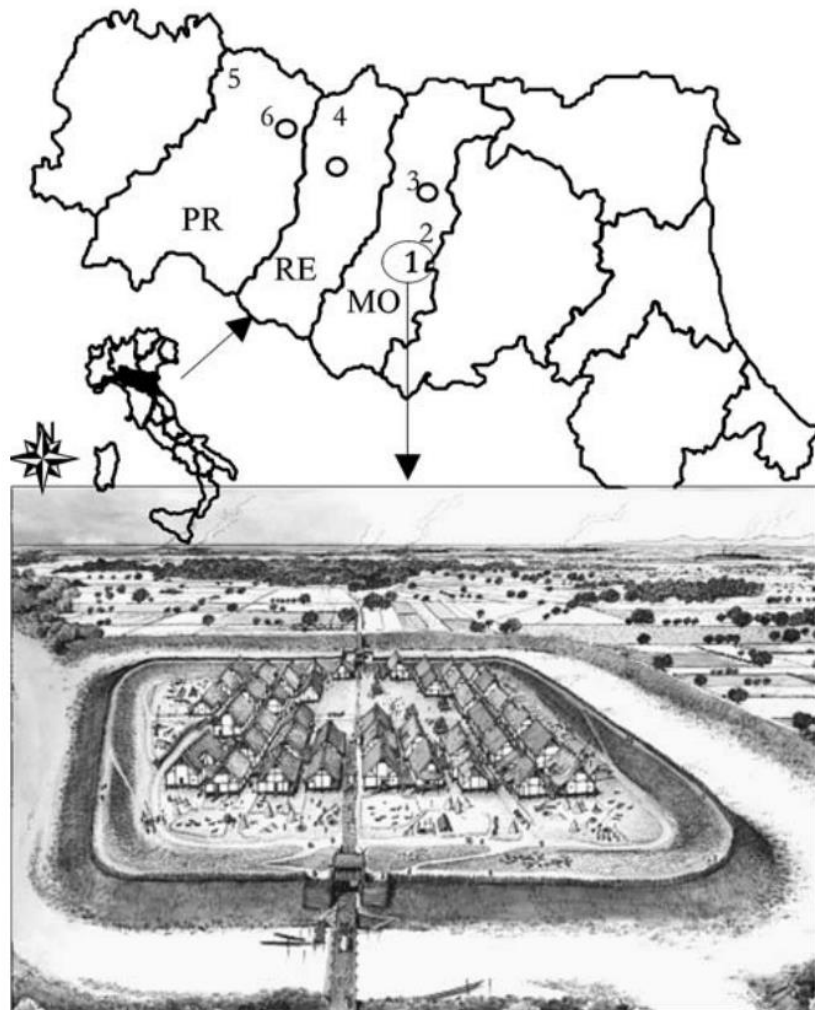


Fig. 1 Map showing the location of those Terramaras with archaeobotanical studies in three provinces of Emilia Romagna, North Italy. The reconstruction of the Terramara di Montale (site 1) was drawn by R. Merlo (modified from Cardarelli 2004); MO, Modena; (1) Montale, (2) S. Ambrogio, (3) Tabina di Magreta. RE, Reggio Emilia; (4), Terramara di S. Rosa. PR, Parma; (5) Castione Marchesi. (6) Parma



Cornelian cherry stones are always more abundant than grape pips, except in the two top phases IX and X, where grape pips dominate



Mercuri, A. M., Accorsi, C. A., Mazzanti, M. B., Bosi, G., Cardarelli, A., Labate, D., Marchesini, M., & Grandi, G. T. (2006). Economy and environment of Bronze Age settlements - Terramaras - On the Po Plain (Northern Italy): First results from the archaeobotanical research at the Terramara di Montale. *Vegetation History and Archaeobotany*, 16(1), 43–60. <https://doi.org/10.1007/s00334-006-0034-1>

The first wine vat?



Medieval leather bags that have been found in archaeological excavations in Estonia
Hirsik, M. (2017) *Viisteist Eesti arheoloogilist nahast kotti*. *Studia Vernacula*, 8: 140–156.

THE REASON OF THE SUCCESS

A real unique enological fruit: rich of juice loaded in sugar and organic acids with a thin skin full of poliphenols and aroma precursors

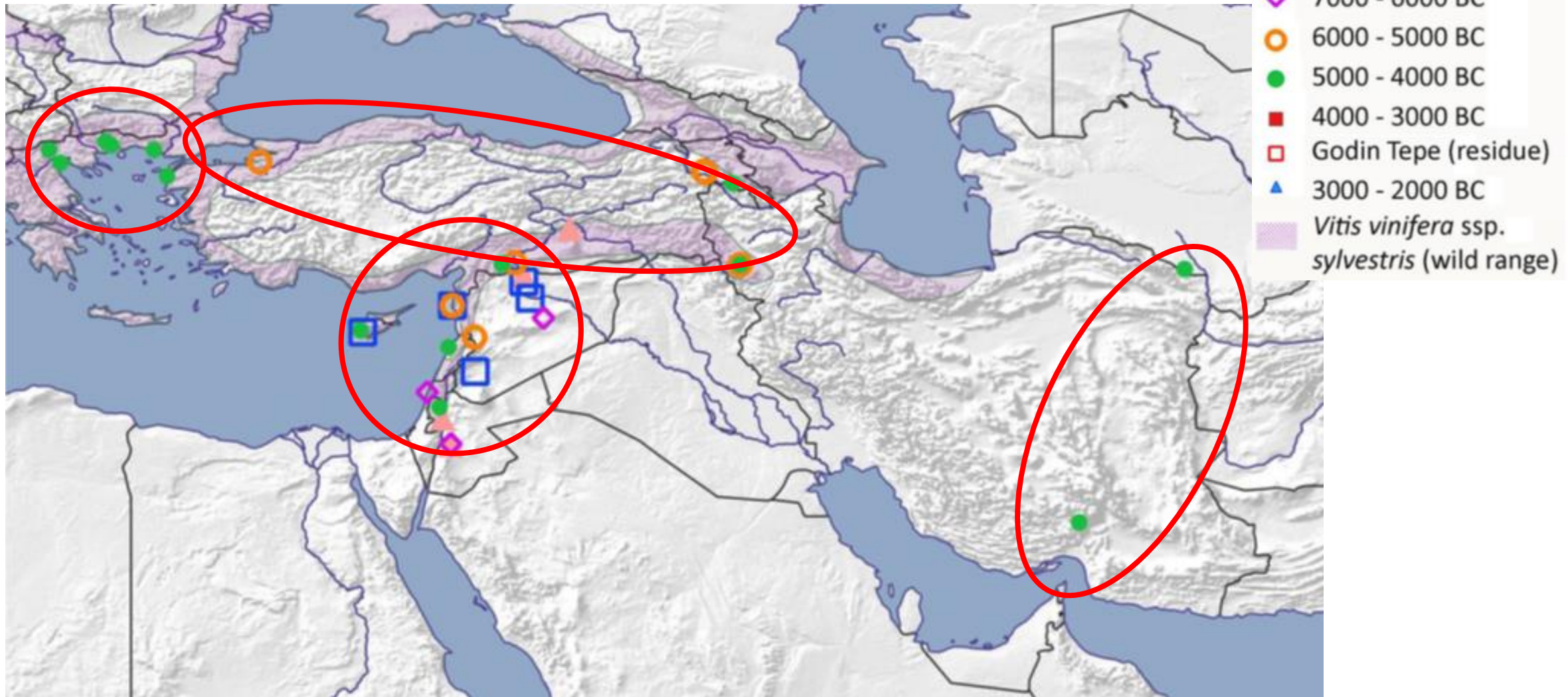


Maghradze et al. 2022 Ampelographic description of wild grapevines. In (D. Maghradze and O. Failla, eds.) , multidisciplinary comparative research to unravel the mystery of its domestication. Shota Rustaveli National Science Foundation of Georgia (SRNSFG). Tbilisi. 384 Pages, ISBN 978-9941-33-220-3

Table 2. Chemical parameters for the wines produced with wild grape, Cabernet Sauvignon, and Saperavi grapes. Data is expressed as average $\pm$ standard error of the three (2017, 2018, 2019) vintages investigated. Different letters mean significant differences (F-test). #: LS, level of significance: ns, non-significant; *, $p < 0.1$; **, $p < 0.05$.

Wine	Wild Grape	Cabernet Sauvignon	Saperavi	LS #
Residual sugars (g/L)	3.0 $\pm$ 0.9 ^a	5.0 $\pm$ 4.5 ^a	1.9 $\pm$ 0.2 ^a	ns
Total acidity (g/L of tartaric acid)	7.1 $\pm$ 0.5 ^a	6.2 $\pm$ 0.2 ^b	7.2 $\pm$ 0.5 ^a	**
Volatile acidity (g/L of acetic acid)	0.5 $\pm$ 0.2 ^a	0.6 $\pm$ 0.1 ^a	0.6 $\pm$ 0.0 ^a	ns
pH	3.6 $\pm$ 0.0 ^a	3.3 $\pm$ 0.4 ^a	3.3 $\pm$ 0.2 ^a	ns
Ethanol (% <i>v/v</i>)	14.2 $\pm$ 0.8 ^a	13.8 $\pm$ 1.0 ^a	13.7 $\pm$ 0.9 ^a	ns
Total phenol content (g/L of catechin)	3.1 $\pm$ 1.1 ^a	1.7 $\pm$ 0.4 ^b	1.7 $\pm$ 0.4 ^b	*
Total dry extract (g/L)	33.6 $\pm$ 3.7 ^a	31.4 $\pm$ 5.3 ^a	25.2 $\pm$ 1.9 ^b	*

9000 – 4000 BC



Fuller, D. Q., & Stevens, C. J. (2019). Between domestication and civilization: the role of agriculture and arboriculture in the emergence of the first urban societies. *Vegetation History and Archaeobotany*, 28(3), 263–282. <https://doi.org/10.1007/s00334-019-00727-4>

Non-Agricultural Coevolution

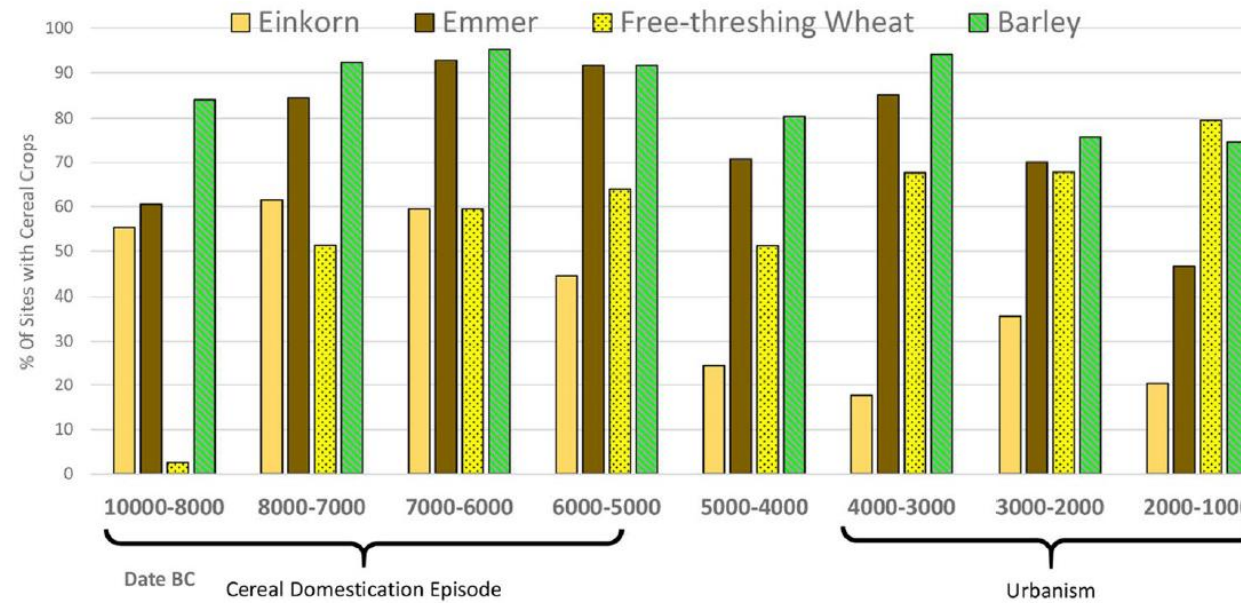
Pre-Domestication Cultivation: Evolution of Domestication Syndrome

Post-Domestication Evolution Cultural Selection/ Crop Improvement

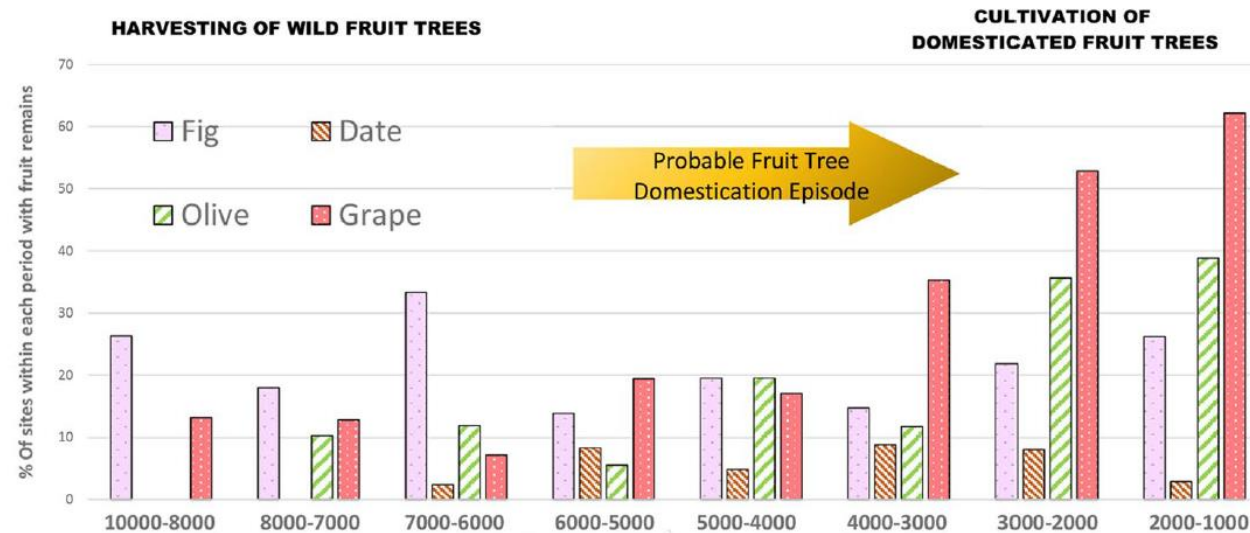
Wild plant food procurement	Wild plant food production	Cultivation with systematic tillage	Domestication syndrome traits appear & increase	Agriculture: cultivation of domesticated crops	processes of agricultural dispersal and intensification
Gathering, burning, tending	Replacement planting, harvesting, storage	Land clearance, tillage		Reliance on cultivation, improved harvesting methods, landscape modification	varietal diversification cultural selection
Foragers using wild progenitors (often secondary resources)	management of wild progenitors (possibly dwindling), range expansion	emergence of arable weed flora (assemblage change); evolution of larger grains, reduction of dispersal aids		dominance/ fixation of domestic-type seed dispersal	diversification, dispersal, improvement
→	→	→		→	
	Increasing labour input per land unit				

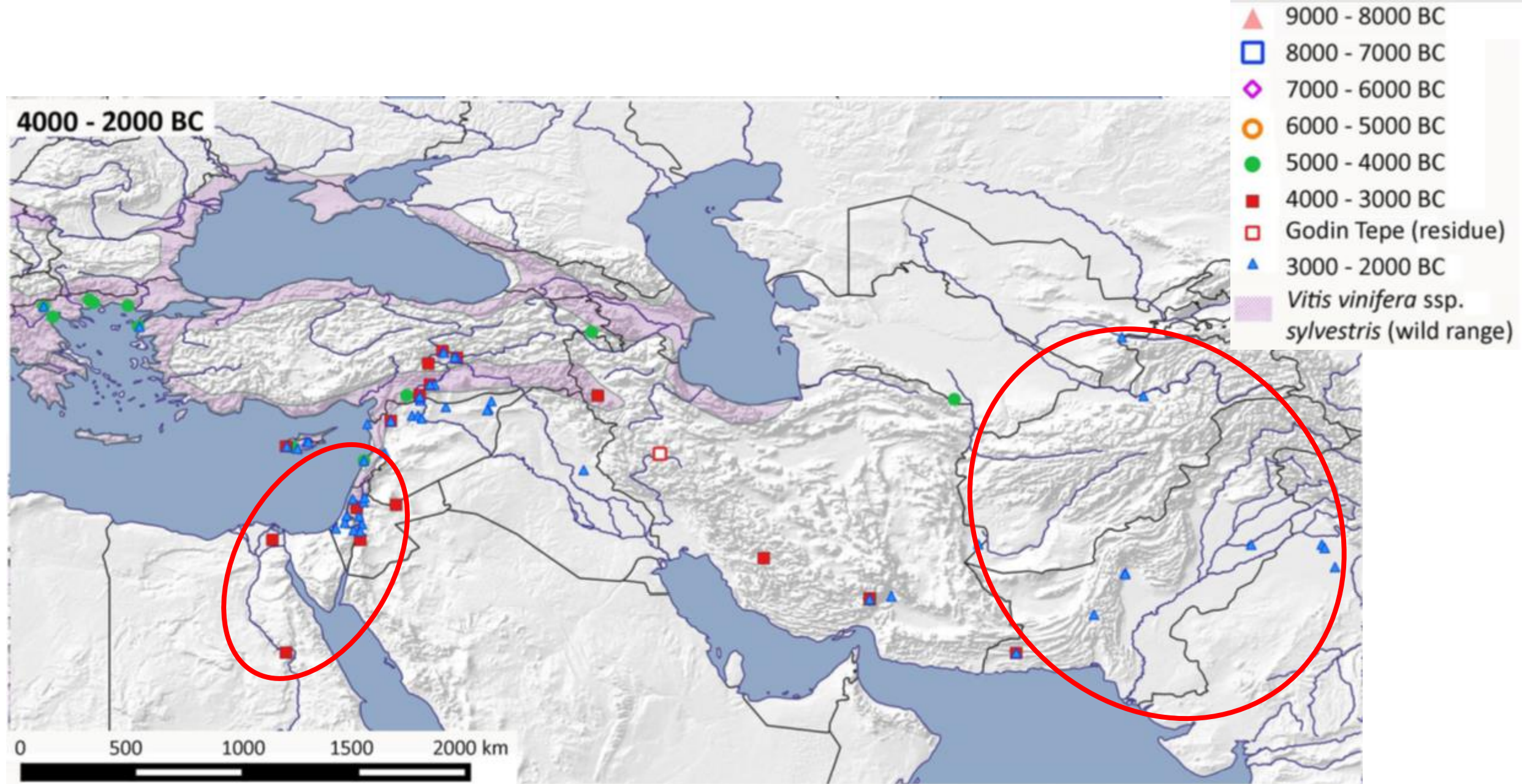
Dorian Q. Fuller, Contrasting Patterns in Crop Domestication and Domestication Rates: Recent Archaeobotanical Insights from the Old World, *Annals of Botany*, Volume 100, Issue 5, October 2007, Pages 903–924, <https://doi.org/10.1093/aob/mcm048>

All Cereals % Sites with Wheat or Barley
as a Total of all Sites



% Of sites with fruit trees as a total
of all sites with botanical remains by period





Fuller, D. Q., & Stevens, C. J. (2019). Between domestication and civilization: the role of agriculture and arboriculture in the emergence of the first urban societies. *Vegetation History and Archaeobotany*, 28(3), 263–282. <https://doi.org/10.1007/s00334-019-00727-4>

Cultura Shulaveri-Shomutepe è una civiltà del tardo Neolitico/Eneolitico (fine del VII - inizio del V millennio a.C.) diffusa nell'attuale Caucaso meridionale, tra Georgia, Armenia, Azerbaijan e Iran settentrionale

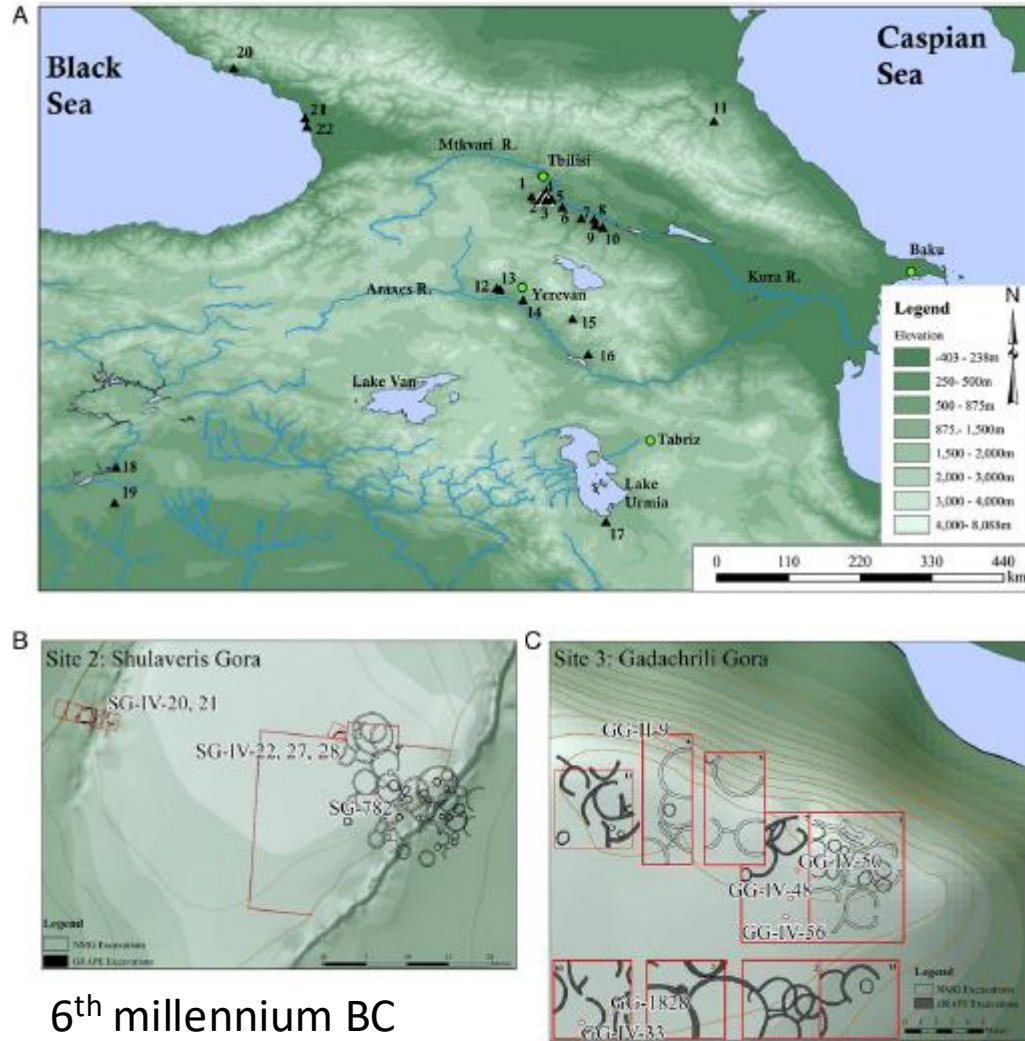


Fig. 1. Map of Shulaveri-Shomutepe Culture sites and other sites mentioned in the text (A) and the early Neolithic settlements of Shulaveris Gora (B) and Gadachrili Gora (C) showing the locations of the analyzed jar sherd samples that were positive for tartaric acid/tartrate. Site names: Anukhlo (1), Shulaveris Gora (2), Gadachrili Gora (3), Dangreuli Gora (4), Inveris Gora (5), Khramis Didi Gora (6), Shomutepe (7), Hacı Bamali Tepe (8), Göytepe (9), Mentesh Tepe (10), Chokh (11), Aratashen (12), Almadzen (13), Masik Blur (14), Ateni-1 (15), Koli Tepe (16), Hajji Firuz Tepe (17), Nevalı Çori (18), Göbekli Tepe (19), Gudau River (20), Pichori (21), and Anaklia (22). GRAPE, Gadachrili Gora Regional Archaeological Project Expedition; NMG, National Museum of Georgia; R, river. Red lines indicate excavated areas and squares.



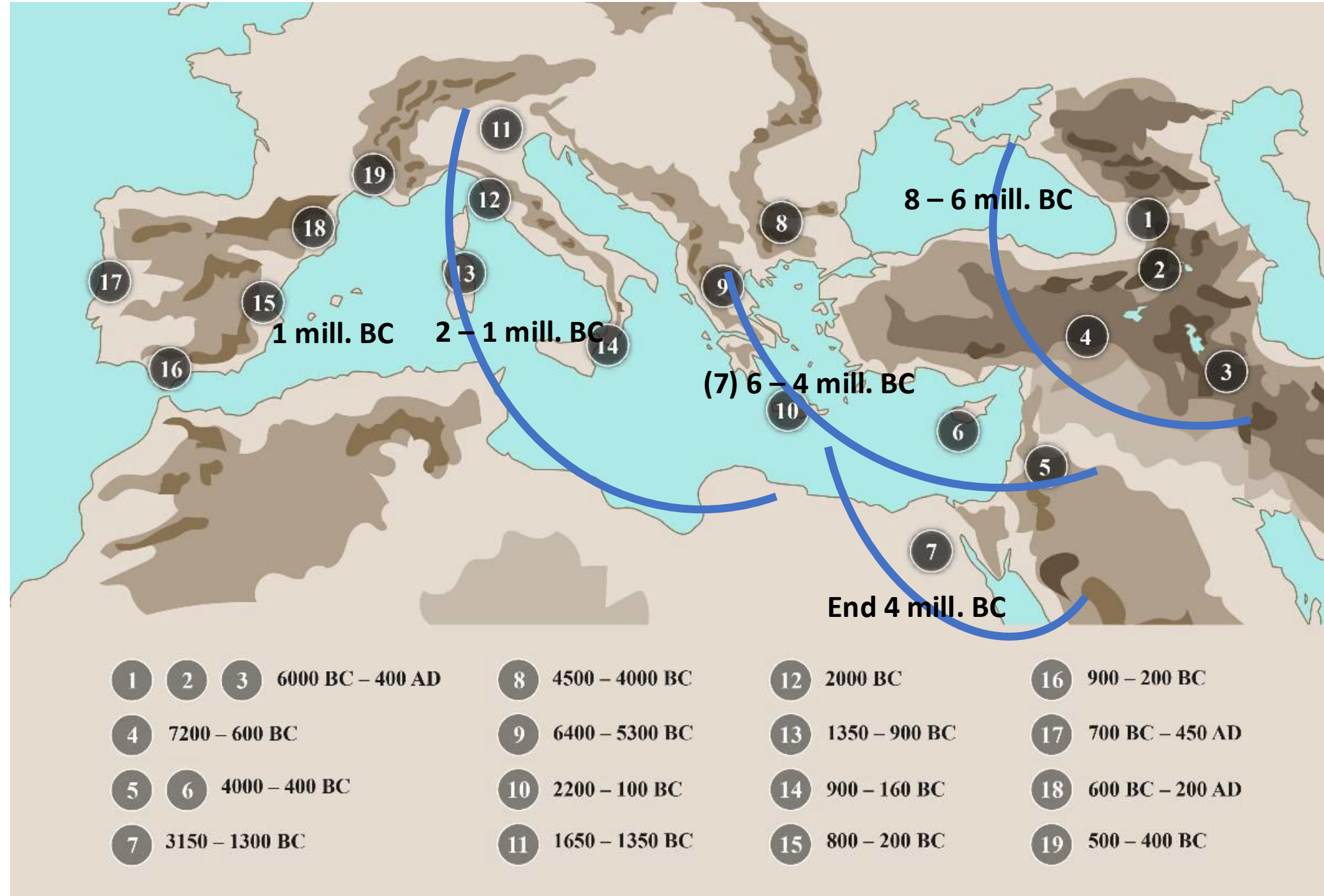
Fig. 2. (A) Representative early Neolithic jar from Khramis Didi Gora (field no. XXI-60, building no. 63; depth, -5.45 to -6.25 m). (B) Jar base SG-16a, interior and cross-section. (C) Jar base SG-782, exterior. Note the textile impression on the base. (D) Jar base GG-IV-50, interior. (Photographs by Mindia Jalebade and courtesy of the National Museum of Georgia.)

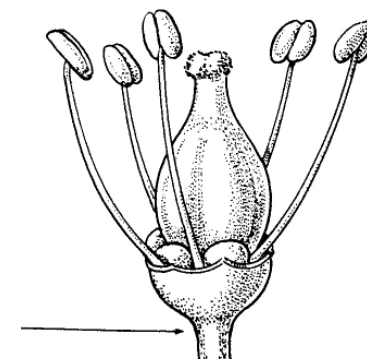
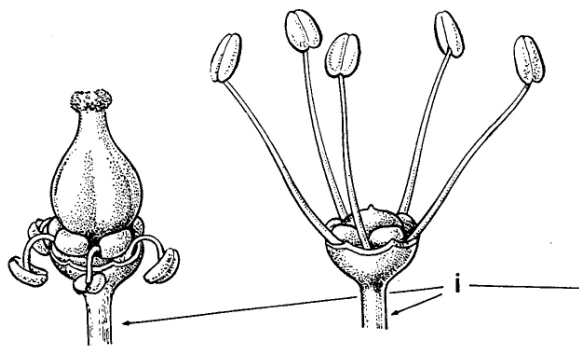
4th millennium BC



An apparent wine press (in front of sign) and fermentation vat (right) emerge during a dig in Armenia

PHOTOGRAPH COURTESY GREGORY ARESHIAN

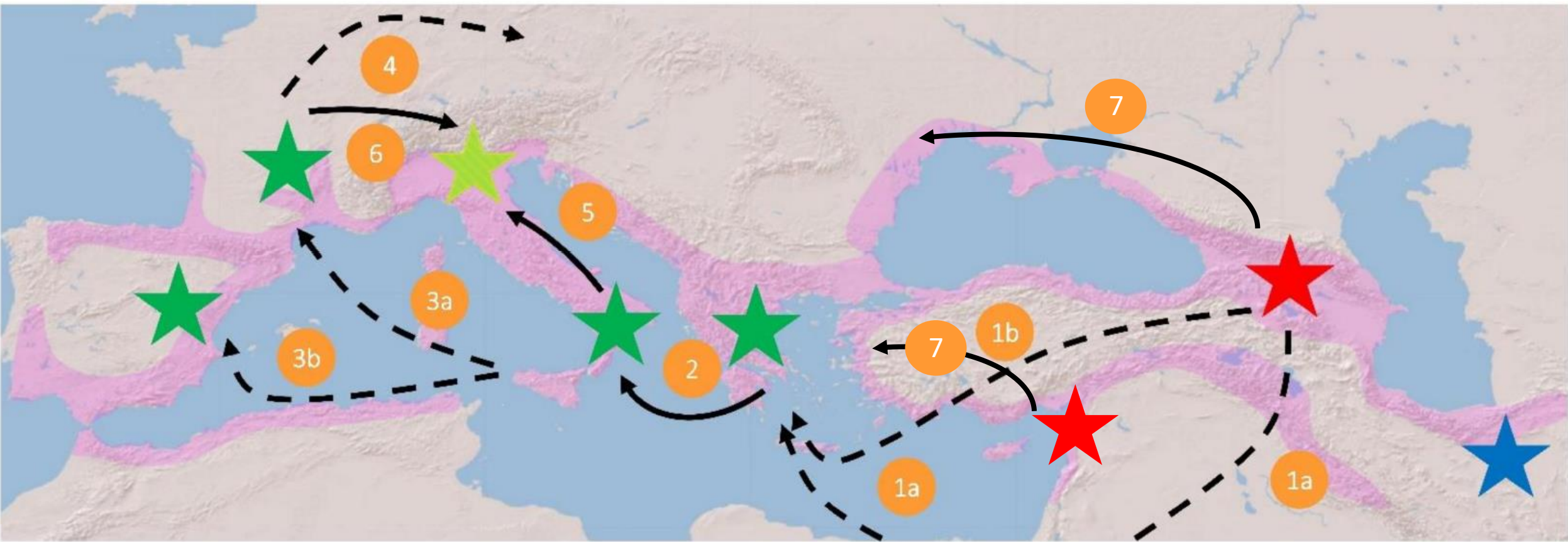




WILD

DOMESTIC





★ Primary domestication center

★ Putative domestication/
diversification centers

★ Center of admixture

★ Putative center of
domestication

→ Migration route confirmed
by molecular data

- → Migration route

1a Buono and Vallariello (2002); Marvelli et al. (2013)

1b Paschou et al. (2014)

2 De Lorenzis et al. (2019)

3a Bouby et al. (2013)

3b Buono and Vallariello (2002); Marvelli et al. (2013)

4 Buono and Vallariello (2002); Marvelli et al. (2013)

5 6 De Lorenzis et al. (2019)

7 Dong et al., 2023 - Science 379, 892

Modified by Grassi, F.; De Lorenzis, G. Back to the Origins:
Background and Perspectives of Grapevine Domestication. Int. J.
Mol. Sci. **2021**, 22, 4518. <https://doi.org/10.3390/ijms22094518>

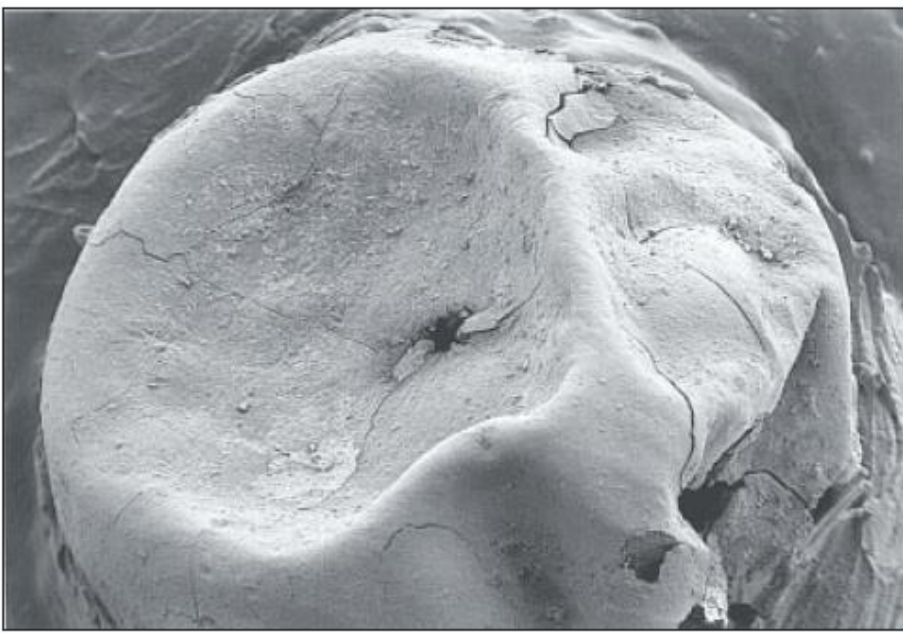


Figure 1 Early Bronze Age charred whole grape or raisin. x11

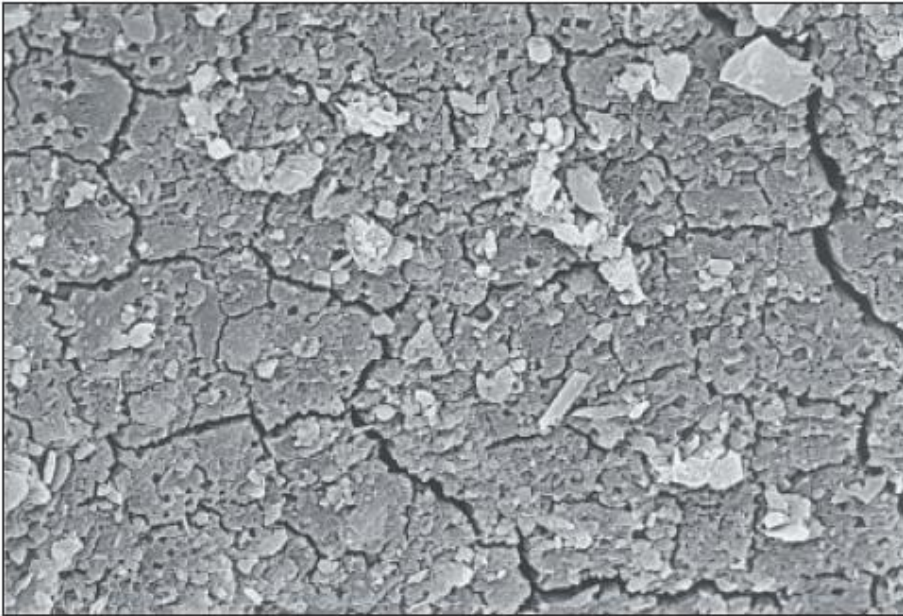
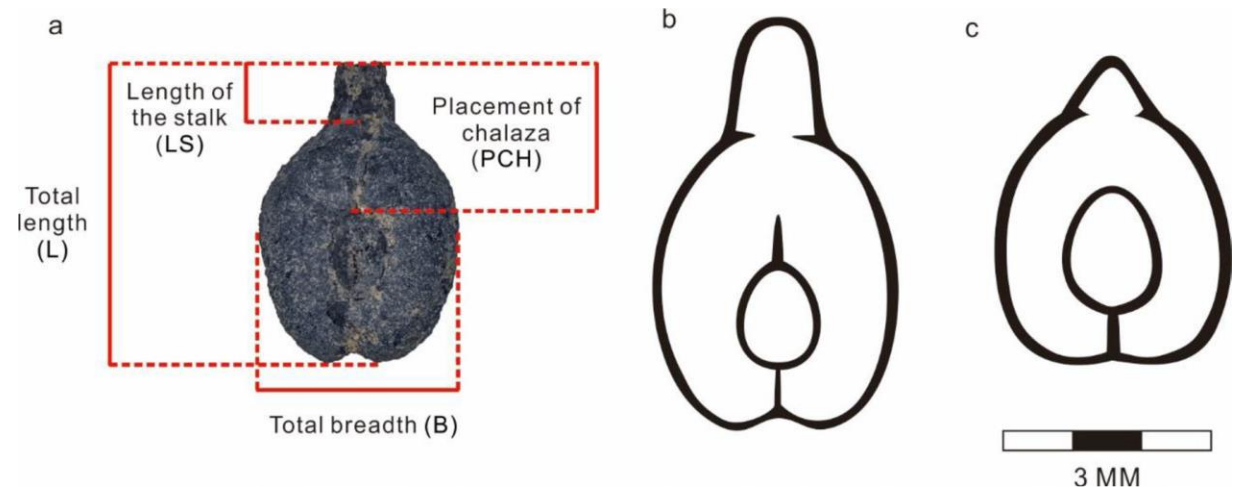
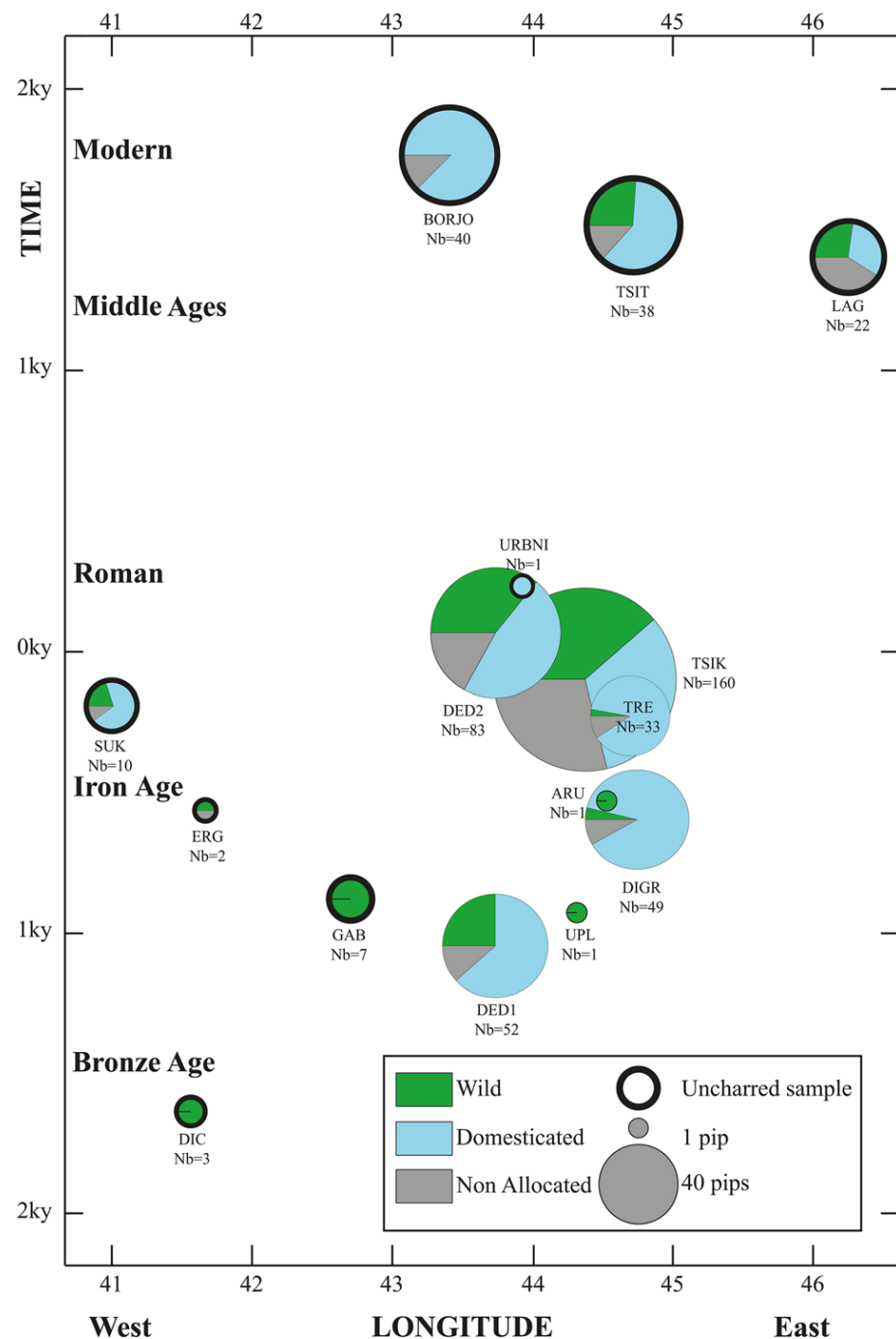


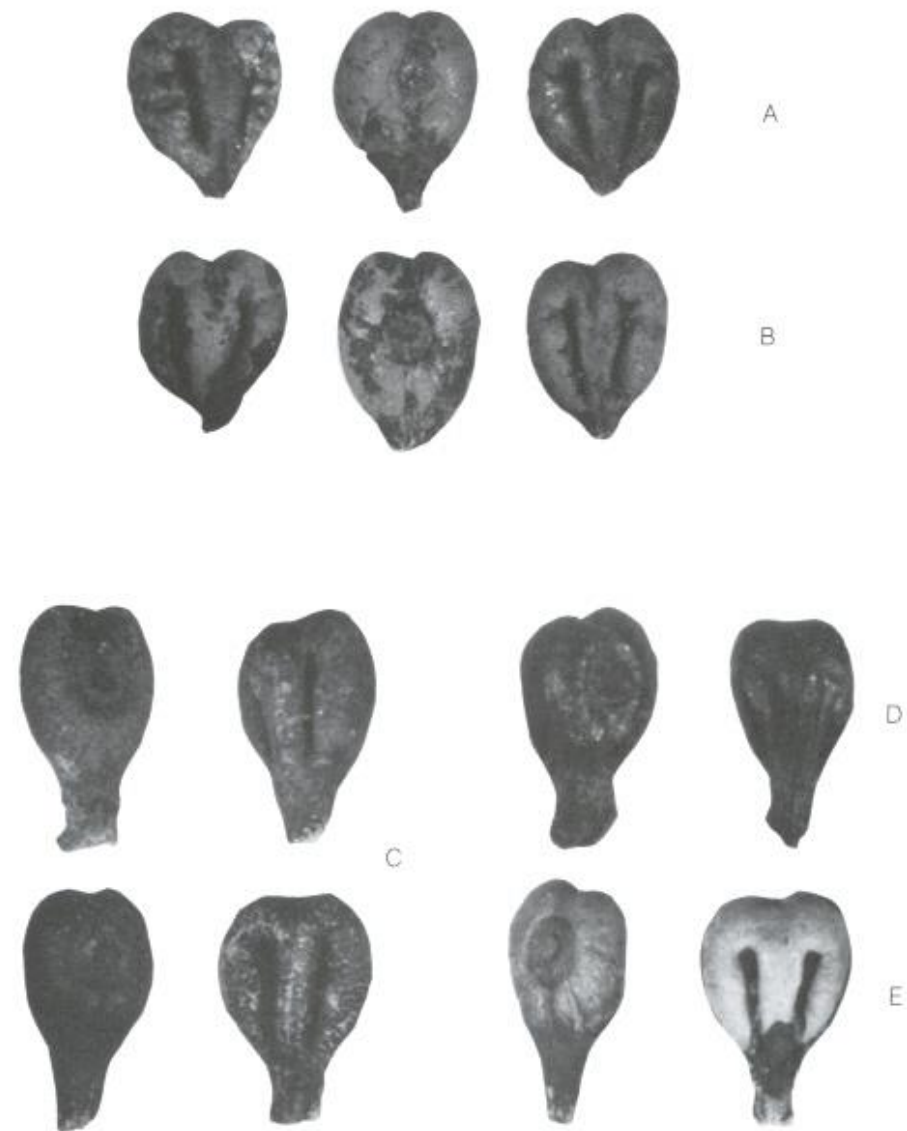
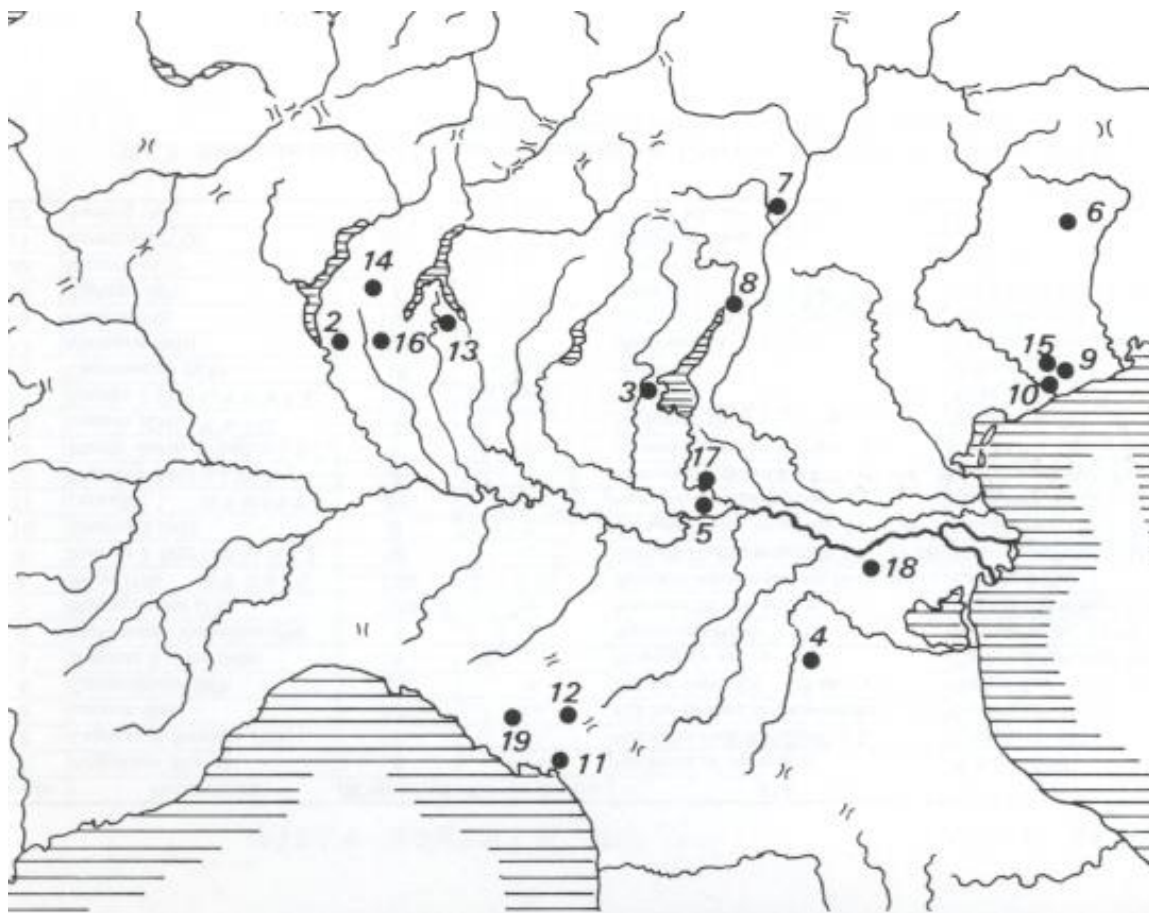
Figure 2 SEM photomicrograph of crystalline features on the grape surface. x1000

Cartwright, 2003 - Grapes or raisins? An early Bronze Age larder under the microscope. *Antiquity*, 77 , 296: 345 – 348
<https://doi.org/10.1017/S0003598X00092322>



Proportions of pips allocated by the LDA to the domesticated and wild morphotypes in each sample. The samples are arranged according to their chronology and location (longitude)

Bouby, L. *et al.* Tracking the history of grapevine cultivation in Georgia by combining geometric morphometrics and ancient DNA. *Veg. Hist. Archaeobot.*, 1–14 (2020).



Di Vora e Castelletti 1995 Indagine preliminare sull'archeologia della vite (*Vitis vinifera* L.) in base ai caratteri diagnostici del vinacciolo, *Rivista archeologica dell'antica provincia e Diocesi di Como*, 176, 333-358.

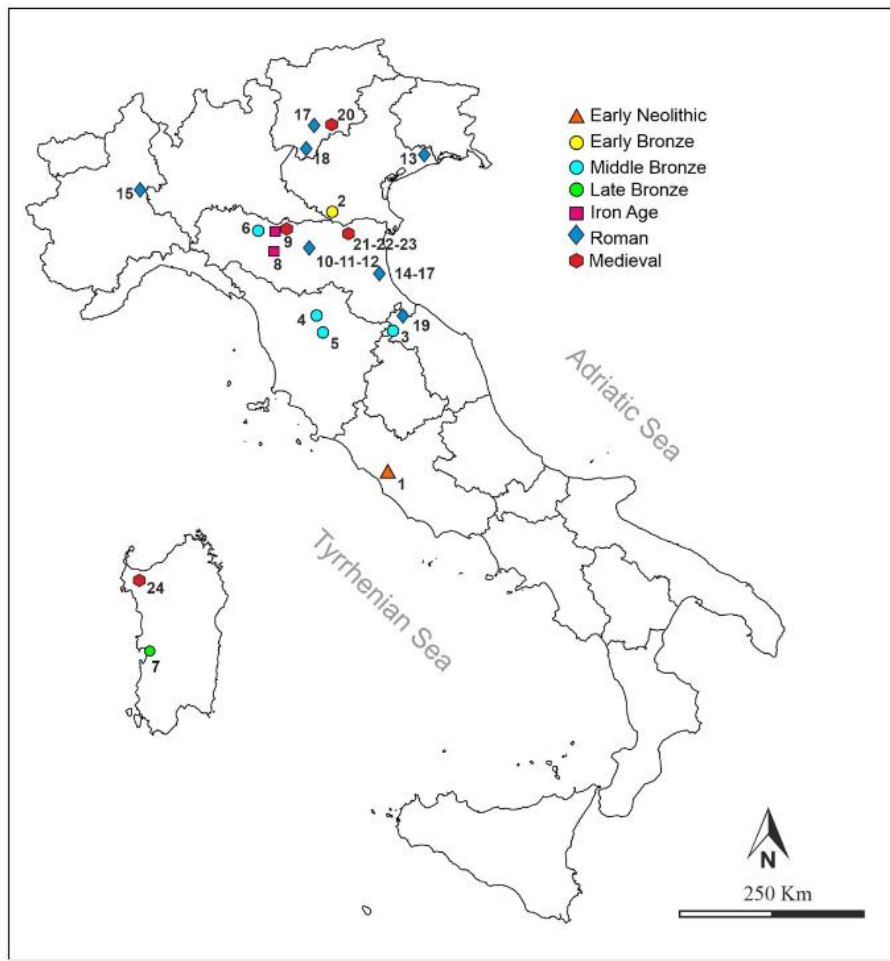


Fig 1. Geographical distribution of the archaeological sites investigated: (1) Anguillara Sabazia - La Marmotta, (2) Canà di San Pietro in Polesine, (3) Pieve di Carpegna, (4) Gonfienti, (5) Firenze - San Lorenzo a Greve, (6) Noceto - Vasca votiva, (7) Cabras - Sa Osa, (8) San Polo d'Enza - Servirola, (9) Parma - Piazza Garibaldi (two contexts), (10) Modena - Area Novi Sad, (11) Modena - Viale Amendola, (12) Modena - Ex Cassa Risparmio, (13) Concordia Sagittaria - Porta Urbis, (14) Cervia - Rotatoria 71B, (15) Vercelli - Corso Prestinari, (16) Trento - Teatro sociale, (17) Classe - Condotto idrico, (18) Nago, (19) Domagnano, (20) Trento - Piazza Duomo, (21) Ferrara - Corso Porta Reno/via Vaspergolo, (22) Argenta - Via Vinarola/Aleotti, (23) Ferrara - Piazza Castello, (24) Sassari - Via Satta. (For more information on each individual archaeological site, see supplementary table [S2 Table](#)).

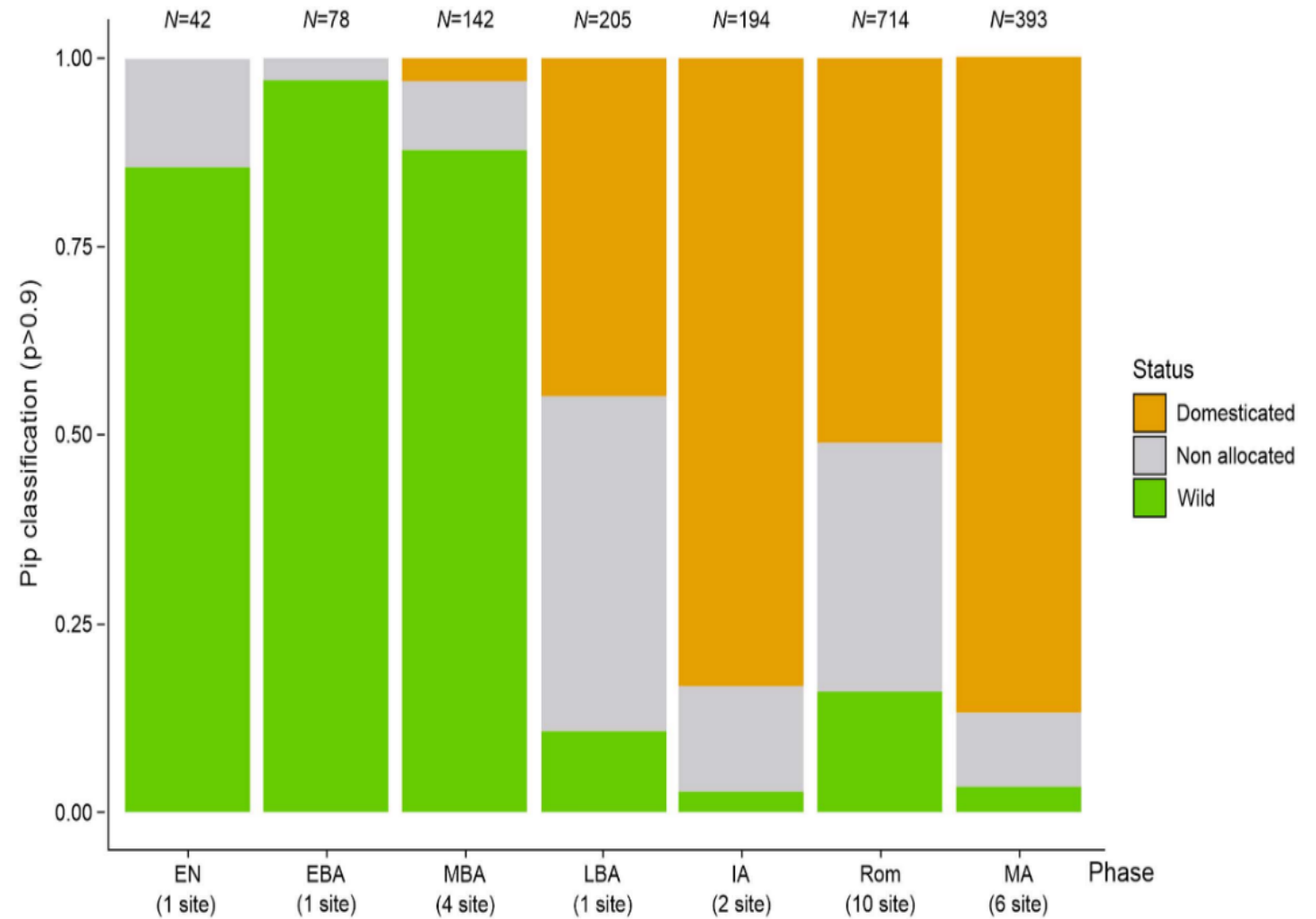


Fig 2. Identification of the wild/ domestic status of the archaeological grape pips according to chronological periods. All classifications with $p < 0.9$ are considered not significant (non allocated).

Ucchesu, Mariano, Sarah Ivorra, Vincent Bonhomme, et al. «Tracing the Emergence of Domesticated Grapevine in Italy». *PLOS ONE* 20, fasc. 4 (2025): e0321653.

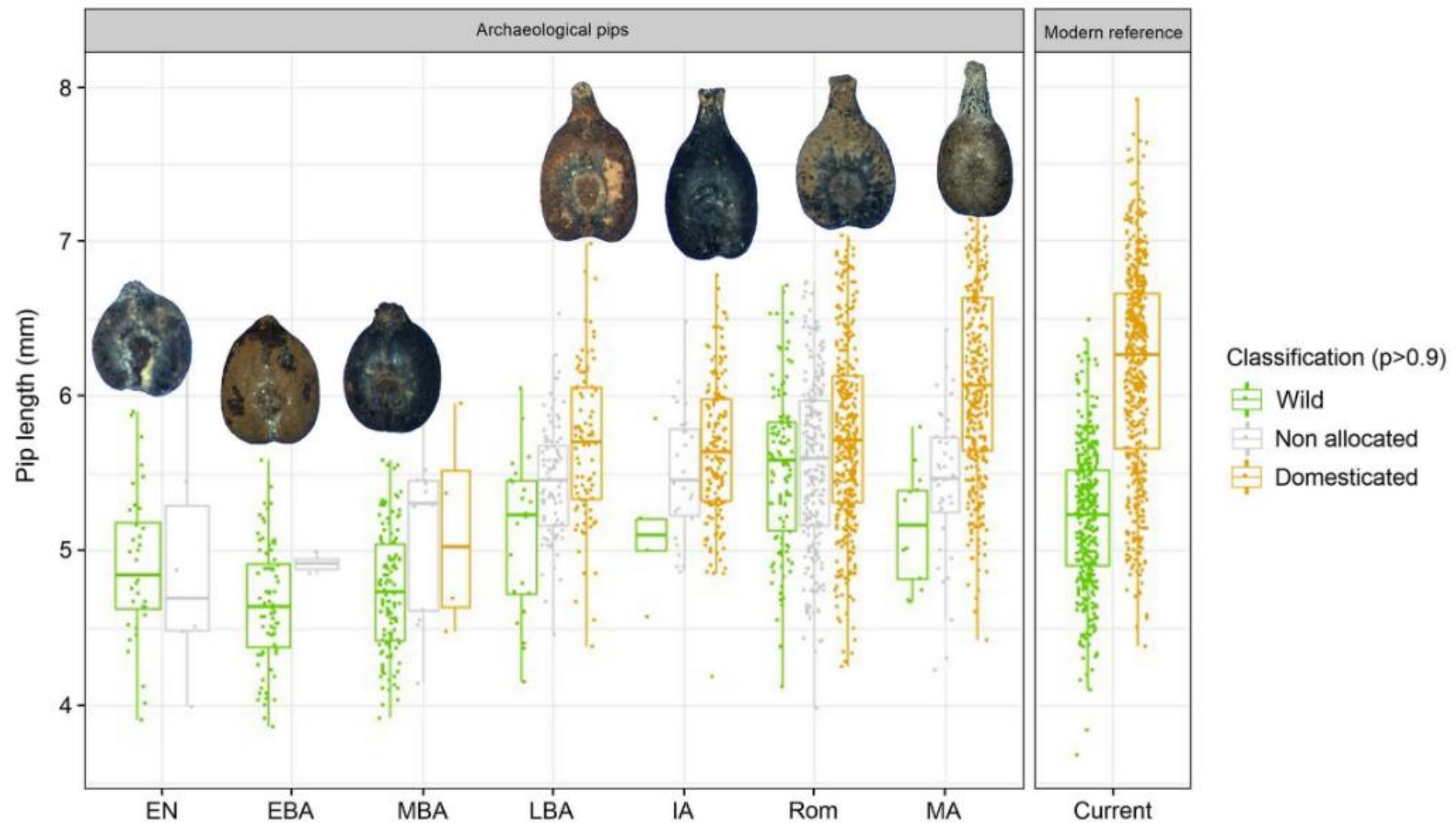


Fig 4. Changes in grape pips length from the 25 studied archaeological sites, categorized into seven chronological periods, distinguishing seeds according to their classification into wild and domestic types, and comparison to current wild and domestic pips.

Figure 5. Examples of waterlogged archaeological pips allocated by the LDA to the wild and domesticated morphotypes.

	Wild morphotype	Domesticated morphotype
Parc St Georges 250-300 CE		
Gasquinoy 100-200 CE		
La Lesse 50-0 CE		

Bouby L, Figueiral I, Bouchette A, Rovira N, Ivorra S, et al. (2013) Bioarchaeological Insights into the Process of Domestication of Grapevine (*Vitis vinifera* L.) during Roman Times in Southern France. PLOS ONE 8(5): e63195.

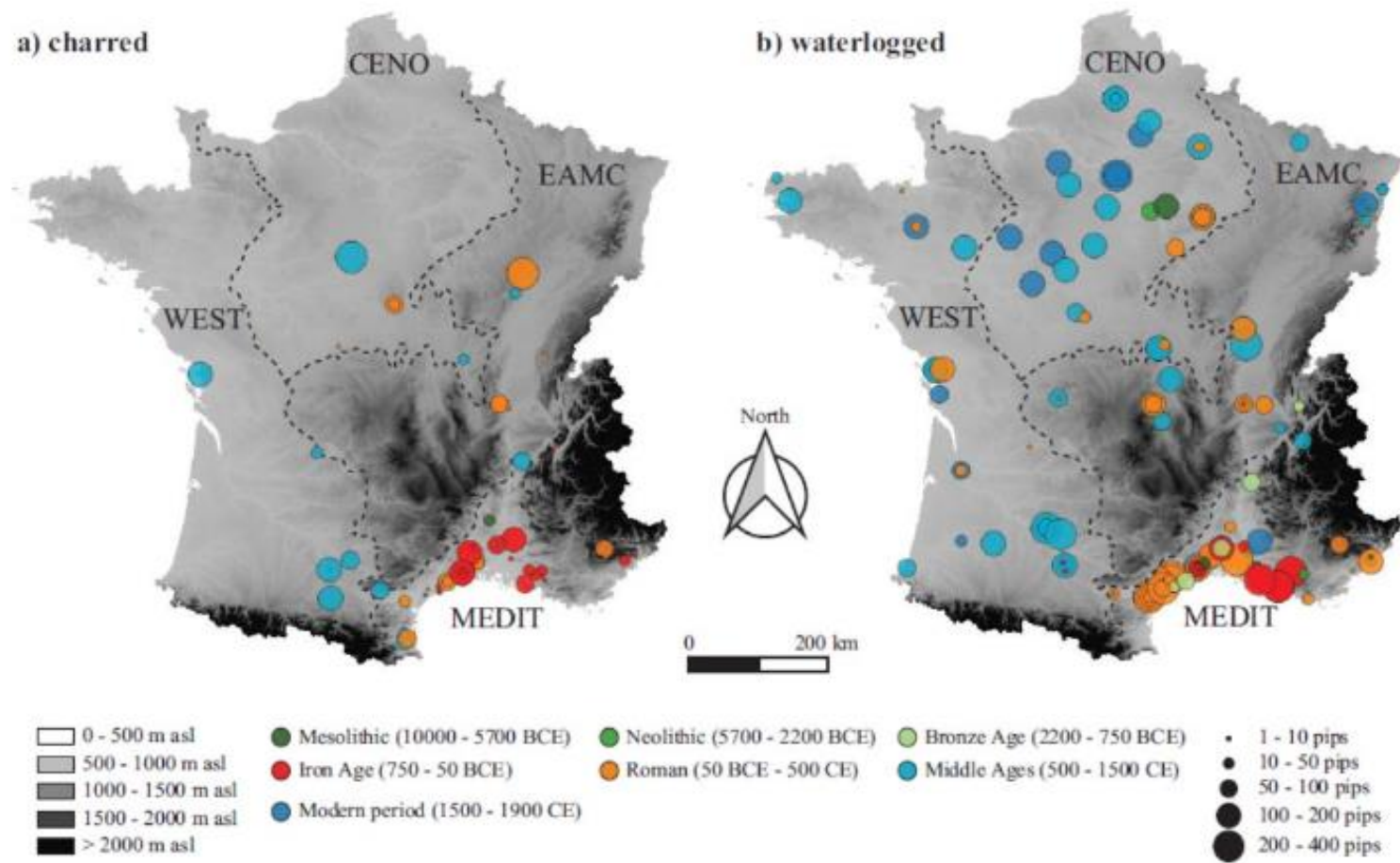
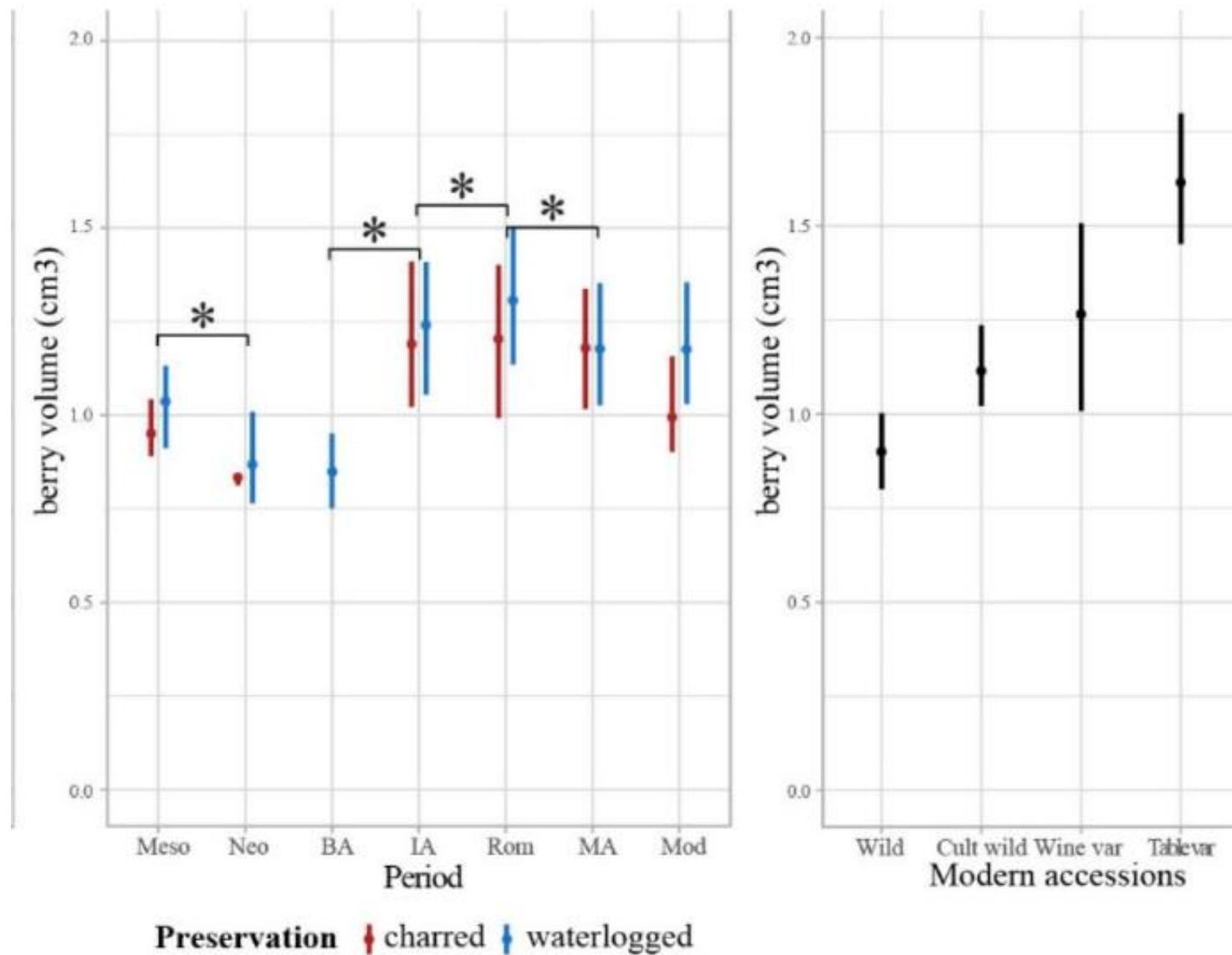


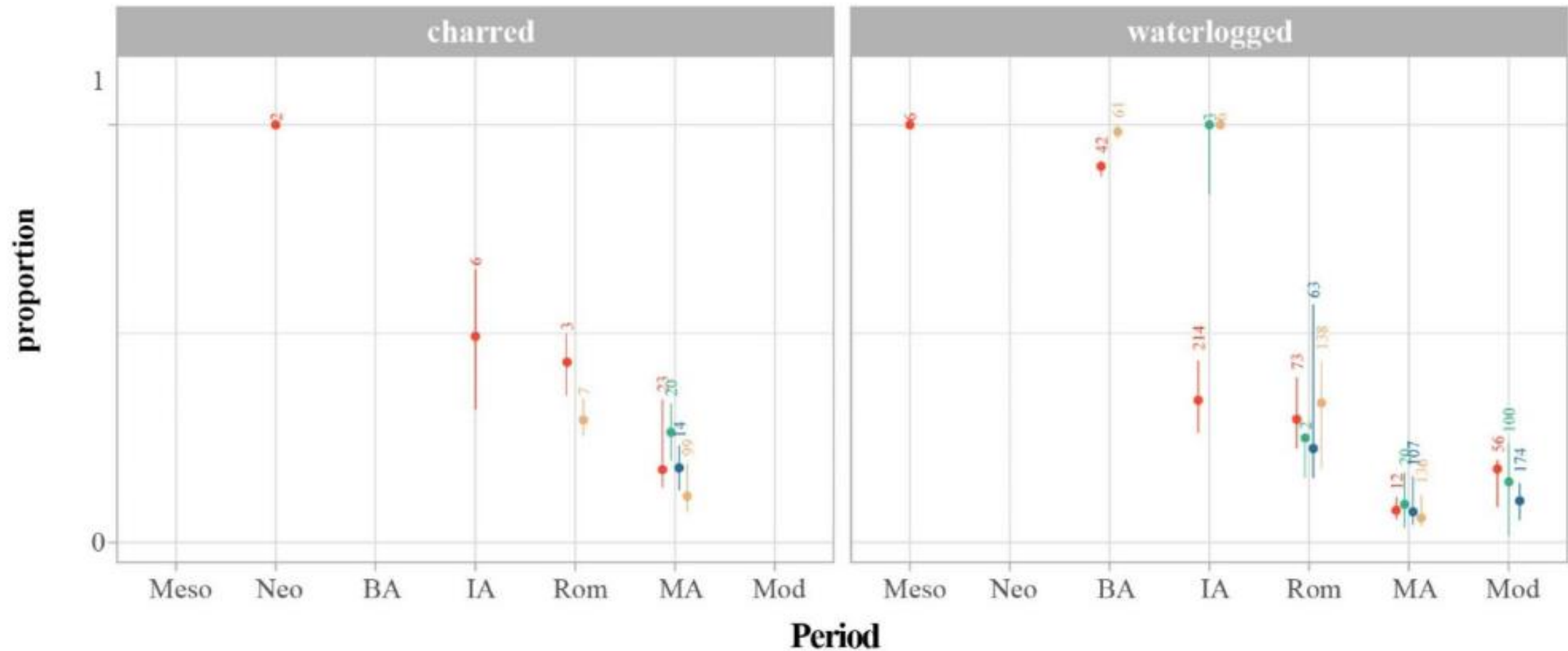
Fig. 1. Geographical distribution of the studied archaeobotanical samples of grape seeds according to the mode of preservation, (a) charred, (b) waterlogged. The colour of the circles indicates sample age and the size is proportional to the number of pips analyzed. The dotted lines represent the limits of the 4 large ecological regions: Mediterranean (MEDIT), West (WEST), Centre-North (CENO) and East-Massif Central (EAMC).

Bouby, L., V. Bonhomme, S. Ivorra, et al. «Seed Morphometrics Unravels the Evolutionary History of Grapevine in France». *Scientific Reports* 14, fasc. 1 (2024): 22207.

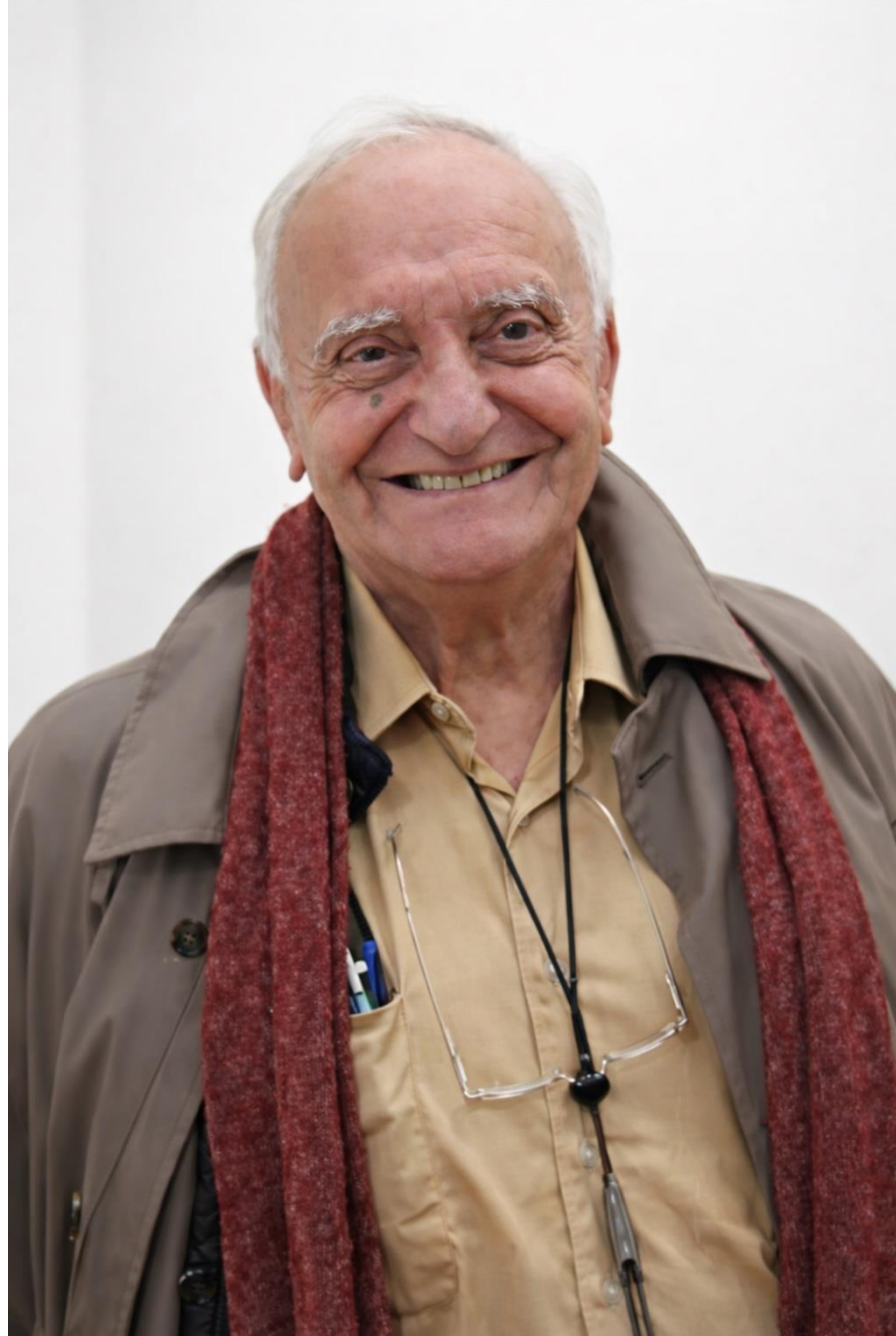


Bouby, L., V. Bonhomme, S. Ivorra, et al. «Seed Morphometrics Unravels the Evolutionary History of Grapevine in France». *Scientific Reports* 14, fasc. 1 (2024): 22207.

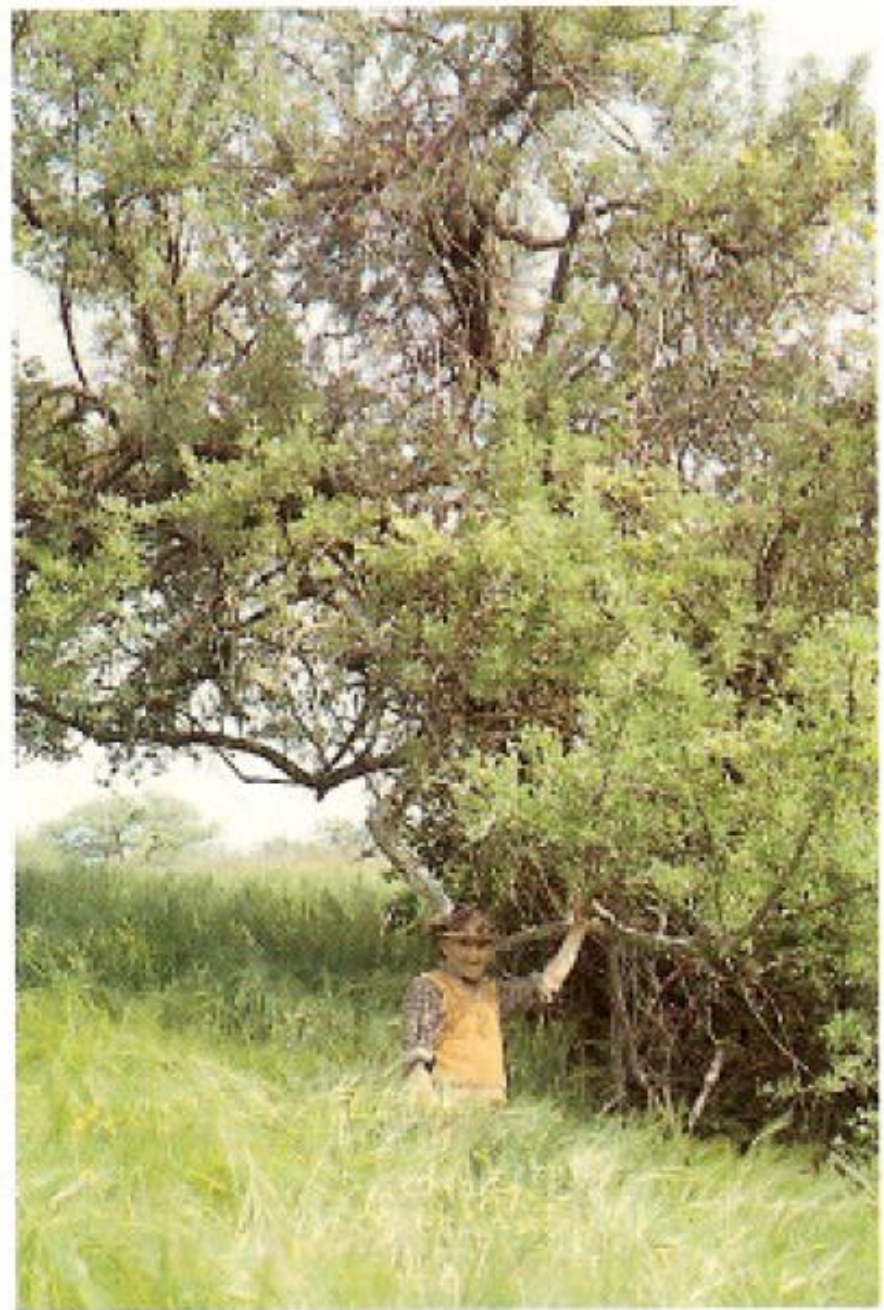
a) Proportion of wild pips



Bouby, L., V. Bonhomme, S. Ivorra, et al. «Seed Morphometrics Unravels the Evolutionary History of Grapevine in France». *Scientific Reports* 14, fasc. 1 (2024): 22207.



Gaetano Forni (1926-2026)



Adelio Pieraccini (?-?) – Poggi del Sasso, 1986