

# The Role of Precooked Staples in Everyday Life in Antiquity:

## Some Documentary Evidences for the Case of χόνδρος

Antonino Pollio<sup>1</sup> and Gianluca Del Mastro<sup>2</sup>

Different species belonging to the genus *Triticum*, and, to a lesser extent, *Hordeum*, can be processed yielding a product that the ancient Greeks called χόνδρος. In this paper the production methods of χόνδρος in circum-Mediterranean countries during Antiquity will be described. Several documentary sources attest a very ancient use of χόνδρος that we find mentioned in Graeco-Egyptian papyri as early as the third century B.C. These documents have been analyzed in parallel with Greek literary sources. In particular, attention has been centred on some passages of Greek comedy (Aristophanes and other authors) that echo a debate born in Rome in the second century AD around the origin and uses of χόνδρος.

### 1. χόνδρος – a botanical introduction

Barley (*Hordeum* spp.) and wheat (*Triticum* spp.) represent two major staples for Euroasiatic populations since prehistoric times. Gathered as wild plants before the seventh millennium, they were early cultivated in the Fertile Crescent and, subsequently, in the Mediterranean region<sup>3</sup>. The domestication processes of both species shows some overlapping steps, as they occurred in the same geographic centers, approximately in the same period, with similar morphological modifications of spikelets<sup>4</sup>.

There are several reasons for the emergence of wheat and barley as staples during the Neolithic era:

- (i) Both cereals produce a significant amount of grain, thus allowing large yields;
- (ii) The grains are small and dry, and have a high starch but low oil contents, and are thus well suited for long storage;

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1 Dipartimento di Biologia, Università “Federico II” Napoli.

2 Dipartimento di Studi Umanistici, Università “Federico II” Napoli.

3 The first efforts to cultivate wheat date back about 10,000 years ago, and probably took place in south-east Turkey. From 9000 BC on, wheat was cultivated throughout the whole Near East, then it spread to the Hellenic peninsula and Southern Balkans, and, subsequently, into the rest of Europe (Shewry 2009; Valamoti Sultana 2011).

4 The domestication of both cereals is mainly characterized by the loss of the dispersion mechanism of spikelet bases (i.e. by the fixation of non-brittle mutations) and by the appearance of hulled and naked types (Harlan and Zohary 1966).

(iii) Caryopsides show a high content of starch, up to 70% of the whole grain, furnishing the half of daily energy consumption by humans (Evers and Nesbitt 2006).

As far as concerns wheat, different species of *Triticum* have been co-cultivated for millennia, and the history of their introduction and domestication is under continuous revision<sup>5</sup>. Wheat domestication's tremendous impact on human life is mirrored by the occurrence of a large *corpus* of ethnographic materials dealing with grains. In the second half of the 19<sup>th</sup> century, J. Frazer in his *The Golden Bough* (Frazer 1995) collected a list of ancient rituals, mainly associated with wheat cultivation and harvesting in different European and Mediterranean Countries, that were not infrequently still alive at his time. From the Osiris myth to Scottish practices of cereal gathering, there is a continuity, based on the common perception of the life cycle of cereals, an alternance between underground and aerial phases, and symbolic representations of life and death<sup>6</sup>.

Although less appreciated in modern times, barley shared with wheat the role of fundamental crop in the Fertile Crescent and circum-Mediterranean countries during the first phases of agriculture<sup>7</sup>, and, at least in Mesopotamia, *Hordeum* species were preferred to *Triticum* ones for several reasons, which are clearly described by Cohen (2007). Barley shows optimal yields in arid climates, and is more salt-tolerant than wheat. Moreover, and most important, it was acknowledged as the best animal fodder by Sumerian farmers. For these reasons, first in southern, and subsequently in northern Mesopotamia, there was a progressive increase in land devoted to barley cultivation during the third millennium. The plant became a key symbol in Mesopotamian cultures, used in “many different contexts, such as conversation, literature, and symbolic domains” (Cohen 2007).

If we consider the Mediterranean Region and particularly the east coast, including the Hellenic peninsula and the surrounding islands, the picture is similar. Barley and wheat species co-exist in

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5 Einkorn (*Triticum monococcum* L.), and wild emmer wheat (*T. dicoccon* Schrank) are probably the early cereals domesticated in Fertile Crescent. The first one was domesticated from *T. boeoticum* Boiss. (Salamini 2002, Oliveira et al. 2011), whereas *T. dicoccoides* (Körn. ex Aschers. et Graebn.) Schweinf. is the wild relative of *T. dicoccon* (Özkan et al. 2010).

6 The centrality of cereals in the Hellenic world since the Bronze age has been very clearly presented by Sarpaky 2009: “Judging from early ethnographic accounts and the wealth of ritual connected with agriculture in traditional Greece, all of the stages of cultivation, including reaping, threshing, and storage, must have been associated with rites that have left no tangible remains in archaeology”. For the relationship between wheat and Demeter/Ceres in Greek and Roman art see Spaeth 1994.

7 *Hordeum spontaneum* C. Koch, the wild progenitor of barley (*Hordeum vulgare* L.) is still colonizing its primary habitats in the Fertile Crescent (Badr et al. 2000), where was domesticated about 8500 years ago. After this first domestication a second one occurred about 1500-3000 km further East. The first domestication led to European and American cultivars, whereas the second one favored the domestication of barley in Central Asia and Far East (Morrell and Clegg 2007).

pre-historic settlements as well as in more recent Bronze Age archaeological sites, where different domesticated grains belonging to the *Triticum* and *Hordeum* genera have been found<sup>8</sup>.

Starch, the most important storage product in cereal grains, cannot be assimilated by humans in its native form, and needs to be processed before consumption. For a very long time wheat and barley grains, together with tubers and roots of other plants, were collected in the wild, and then grinded and pounded before being used as food. These processes are necessary to remove indigestible fibers and toxic substances<sup>9</sup>. Also cooking was an early discovery of humans and cracked cereal grains have been consumed following a precooking procedure since Prehistoric times<sup>10</sup>. Similar preparations are still alive in Near East and Central Asia and can give us useful indications about the steps needed for its preparation. The cereals used in these preparation are prevalently emmer (*T. dicoccon*), and to a lesser extent, einkorn (*T. monococcum*). In brief, spikelets are wetted with water, and then pounded with a mortar. The mixture obtained is dried and chaff is separated from seeds by winnowing, followed by coarse and medium-coarse sieving (dehusking). In hulled wheats, a further treatment is necessary. The grains obtained are pounded again, and after this, the bran is separated by winnowing and sieving<sup>11</sup>.

After these preliminary steps, the clean grains are boiled<sup>12</sup> and subsequently placed in a mortar and cracked with a pestle. Then, the cracked grains are sun dried, and finally stored. Precooked cereals, after rapid soaking in water, can be consumed throughout the year, and this can be considered one of the first successful food biotechnological process developed by mankind (Valamoti Soutana 2011)<sup>13</sup>, probably invented before baking. According to Valamoti Soutana (2011), both

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8 Einkorn, emmer, free-threshing wheat, two-row hulled and naked barley, and hulled six-row barley have been identified in Early Neolithic sites of Northern Greece (Valamoti Soutana and Kotsakis 2007).

9 Stone tools used to grind plant materials were already used in Upper Palaeolithic, thousand years before the origin of the first Agricultural practices. Moreover, the spreading of the techniques used to prepare foods from grains stimulated also the collection of wild cereal seeds, that represented the preliminary step to their domestication (Piperno et al. 2004).

10 For the archaeobotanical evidence of this process in Greece, see Valamoti Soutana 2011.

11 For a detailed description, see Evers and Nesbitt 2006 (checklist for recording the cultivation and use of hulled wheats).

12 Cooking destroys the physico-chemical structure of starch (for a detailed description of starch structure, see Tester et al. 2004; Zeeman et al. 2010), allowing rapid and effective digestion. Heat can be applied to cereal grains under different temperature and moisture conditions (Crowther 2012); starch granules, when heated above 60°C and immersed in a large volume of water, undergo gelatinization, a process leading to the complete dissolution of starch structure, and in this way become fully digestible. On the other hand, high temperature (>200 °C) in absence of moisture does not induce significant changes in starch granule structure. This process is called melting, and can be observed after dry cooking methods, as baking.

13 The author suggests that, from Prehistoric times on, cereals could be cooked in water or in milk, as in modern Greece *Trahanas* (made with wheat boiled in milk and salt) and *Pligouri* (cracked bulgur boiled in water).

barley and wheat (einkorn and emmer) were used for this food preparations since Neolithic and Bronze Age. Despite the modern wide diffusion of this effective method of preparing cereal grains in Greece and the circum-Mediterranean region, there is uncertainty about its relevance to everyday life in Antiquity.

## 2. Documentary evidences on χόνδρος

In this part of our study, we intend to discuss several aspects of the ancient evidence for pre-cooked cereals. We will not treat the occurrences in literature, except where it is necessary, both because we are limiting ourselves to a narrow study and because, for the first time, we will privilege wherever possible the documentary evidence preserved on papyrus or other written materials.

The term χόνδρος indicates in Greek a coarse porridge—not to be confused with the finer ones called ἄλευρα (grain flour) or ἄλφιτα (barley flour). It is derived from several types of cereals and prepared by boiling into water the cleaned and sifted grains, treated with sand and plaster. The product obtained in this way, even if used some time later, can be stretched with water, milk, honey, or other substances. The term χονδρός, which means “granular”, was used as a synonym of “handful” or “pinch” (of salt, e.g.), for instance in Hippocrates (*De medico* 17) and in the mime by Sophron preserved in PSI XI 1214<sup>14</sup> (Fr. a, line 3: ἄλος χονδρόν). Note that in the papyrus, the scribe, or more likely a reader (the papyrus is dated to the 1<sup>st</sup> century AD), has added the accent on the first *omicron* in χονδρός. In poetic texts on papyrus, a grave accent can be found on non-accented syllables; perhaps in this case, the accent has been added precisely to avoid confusion with χόνδρος, which, at the time, ought to have been well-known. Of the diffusion of this porridge we find evidence in the verb χονδρεύω, which means literally “to make χόνδρος” (Hesychius, s.v.), and in the term χονδροκοπέιον, which indicates the grinder used to refine the χόνδρος (Hesychius, s.v.; Pollux 3, 78; 7, 19). In a painted inscription, dated perhaps to the second half of the third century BC and probably from Alexandria, a petitioner (whose name is lost in a lacuna) is described as a χονδροκόπος, a grinder of χόνδρος (Crawford 1967).<sup>15</sup>

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14 LDAB (*Leuven Database of Ancient Books*, <http://www.trismegistos.org/ldab/>), 3961. The papyri are cited according to the *Checklist of Editions of Greek, Latin, Demotic and Coptic Papyri, Ostraca and Tablets*:

[http://library.duke.edu/rubenstein/scriptorium/papyrus/texts/clist\\_papyri.html](http://library.duke.edu/rubenstein/scriptorium/papyrus/texts/clist_papyri.html). Last access 15 Sept. 2015.

15 She wonders why this ἔντευξις (now in a private collection in England) was painted on rock, and decides against the possibility that it was a writing exercise (the hand seems to be that of a professional), believing that it was the voluntary recording of a memorable event on the part of the χονδροκόπος.

A very interesting, early epigraphic attestation comes from Persia (now Iran), specifically from the Takht-e Jamshid zone (ancient Persepolis), in the north-east of Shiraz<sup>16</sup>. The inscription, whose original does not survive, was seen during the expedition of Alexander the Great, and can be dated to the era of Cyrus the Great (549-529 BC). It was recorded by the rhetorician Polyaeus (2<sup>nd</sup> century AD) in his *Stratagems*<sup>17</sup>. The context, which we borrow from Polyaeus' description, is the conquests of Alexander. He, once the Cosseans were subjugated, occupied the region, and, during his long stay, in an inscription on a bronze column in the royal palace, read a list of the agricultural products which had to be provided to the Persian king and his army every day<sup>18</sup>. Dozens of foodstuffs and different types of cereals were listed. Among these, 200 artabas stick out (διακόσια ἀρτάβαι; one artaba is about 40 liters) of coarse porridge obtained from grain: χόνδρου δὲ ἐξ ὄλυρων πεποιημένου<sup>19</sup>. This is a first clear indication that χόνδρος was derived from ὄλυρα, i.e. spelt.

A similar and, in some cases, equivalent product that we find in the papyrus evidence is ἀθήρα. According to Pliny<sup>20</sup> and St Jerome<sup>21</sup>, it is a specifically Egyptian term. Some scholars, among whom is Fournet (1989, 72-73), have strengthened this hypothesis. To Emanuela Battaglia's analysis in her monograph on the lexicon of bread-making (Battaglia 1989, 103-104) we add that also for Hesychius<sup>22</sup>, it is a typically Egyptian food, derived from boiling grains (which he calls πυρός, wheat, generically) in milk<sup>23</sup>.

There does not seem to be a big difference between ἀθήρα and χόνδρος, but the former is more often connected to ὄλυρα. Even as late as the 6<sup>th</sup> century AD, we read in a papyrus (*P.Cair.Masp.* II

16 IK 227 VI Perside, n. 227 Canali De Rossi 2004, 131-132.

17 IV 3, 32, 7 and 60.

18 Polyaeus would have derived the story from Ctesias of Cnidus. The inscription was probably in Greek and Alexander had it immediately destroyed, as seems from the most likely reconstruction of events of Polyaeus' version. Cf. Canali De Rossi 2004, 132.

19 Further on (paragraph 60), χόνδρος is again cited in connection to the quantity necessary for when the king was inhabiting one of his secondary residences (at Babylon, Susa or in Media). The quantity requested is 500 mari (a μάρικ is about 1.2 liters).

20 *N.H.* XXII 121: *Hac decocta fit medicamentum, quod Aegyptii atheram vocant, infantibus utilissimum, sed et adultos inlinunt eo.* On the decoction derived from lotus seeds with the same characteristics (mixed with water or with milk), cf. Pliny, *N.H.* XXII 56. This raises the suspicion that this product was originally called ἀθήρα, and that this term came to be used to designate the similar product made from cereals. But in the absence of evidence, this remains only a hypothesis.

21 *In Gen.* XLV, 21: *Moris est Aegyptiorum θήραν etiam far vocare, quod nunc corrupte atheram nuncupant.* On this passage, see the timely considerations of Walters 1973, 182.

22 S.v.: <ἀθήρα> βρώμα διὰ πυρῶν καὶ γάλακτος ἠψημένον παρ' Αἰγυπτίοις.

23 On this topic, see *infra* and Matijašić 2011.

67141, II 9) about an ἀθήρα derived from barley: εἰς ἀθήραν πτισάνης<sup>24</sup>. Additionally, in his *Lexicon*, Photius affirms that ἀθήρα (with the orthographic variants ἀθήρη and ἀθέρα) derives ἐκ πυρῶν ἐψημένων καὶ διακεχυμένων (“from boiled and ground grains”)<sup>25</sup>.

In Egypt, as in Greece, we find ἀθήρα used in festivals. In a papyrus from Tebtynis, now at Berkeley and assigned to the 1st century BC (*P.Tebt.* inv. 131 = SB XVI/2 12675<sup>26</sup>), which preserves a list of products required for a reception in honor of a guest (a certain Crito), orders are given for the preparation of a large quantity (c. 70 artabas) of ἀθήρα, among other things.

Battaglia, in her study on bread-making in Egypt cited above, offers a list of 13 papyri in which the term ἀθήρα is found, and two in which the diminutive ἀθήριον is. The chronological arc over which these occurrences are spread is very large, but a good eight testimonia stem from the first three centuries BC. As for χόνδρος, we note that the diffusion of porridges of grains with hulls was wider earlier, without forgetting that they continued to be used later on.

Several testimonia have been published after Battaglia’s work<sup>27</sup>. Among these, *P.Oxy.* LXV 4480<sup>28</sup> occupies an important position, in my opinion. It is a death notification from Oxyrhynchus, dated to 26 Feb. 311 AD (day 2 in the month Φαμενώθ), in which a certain Aurelia Eirene, daughter of Ammonius, reports the death of her husband Isidorus, son of Hierax, to Besammon the συστάτης, and says that he was χριστής τὴν τέχνην γενόμενος (i.e. χειριστής, “by profession, assistant to the market”) in Alexandria. This type of announcement served as ἐλάττωσις, that is as a release from the tax *pro capite* which burdened the Egyptians who did not manage to claim Greek descent. In fact, a different hand wrote the term ἐλάσωσις (with different pronunciation from Classical Attic) and adds the label Ἰσιδώρου [Ἰέρ]ακος χι(ριστοῦ) ἀθηρᾶ (i.e. ἀθηρᾶς), which we could translate as “assistant for the sale of porridge”. To make it easier to find this document in the συστάτης’ archive, a second functionary at Oxyrhynchus specified the type of request and the job of the deceased. Even in the 4<sup>th</sup> century AD, there was a profession connected to these grain products, especially at Alexandria, the fundamental crossroads for business and people. In another document (*P.Oxy.* XII 1432<sup>29</sup>), we find

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24 TM (Trismegistos, <http://www.trismegistos.org/>), 65004.

25 On this passage, see Matijašić 2011, who, on the basis of an interesting entry in Photius’ lexicon that explains the term ἀθήρα (α 471 Theodoridis, which can be found also in the *Συναγωγή λέξεων χρησίμων*, which was, in turn, derived from the lexicon attributed to Cyril of Alexandria), conducts a careful analysis of the work of the historian Hellanicus of Lesbos from whom the fragment (FGrHist 4 F 192) is derived.

26 TM 3767 (a photograph can be found at <http://www.pappal.info/tm/3767>; last access sept. 2015).

27 Note, among others, *P.Kellis* IV 96 (TM 23651), *P.NYU* II 51 (TM 121983), and *P.Tebt.* V 1151 (TM 3748).

28 TM 78579.

29 TM 21836.

the profession of the ἀθηροπώλης. This product was sold under a monopoly in the Ptolemaic period: in *P.Jen. inv.* 900 (=SB VIII 9841, 4, 19<sup>30</sup>, from the Oxyrhynchite Nome and dated to 247 AD), there is mention of a μονοπωλίαν τῆς ἀθήρας. In *P.Oxy.* XLIV 3189<sup>31</sup> is mentioned a tax on sellers of ἀθήρα: τέλος ἀθηροπωλῶν.

Very often, χόνδρος, already boiled before conservation, was not soaked in water but in milk as part of its preparation for consumption<sup>32</sup>. A fragment of the *Procris* by the comic poet Eubulus (4th century BC), reported by Athenaeus<sup>33</sup>, describes the dog of the protagonist being treated like a man: “Strew, then, soft carpets underneath the dog, And place beneath cloths of Milesian wool; And put above them all a purple rug.” “Apollo!” the other person responds emphatically. The first replies “Then, soak (δεύσετε) χόνδρος for him in goose’s milk (γάλακτι χηνός)”<sup>34</sup>, and the other person exclaims “O Heracles!”<sup>35</sup>. The hyperbole of “goose milk”, which is found in many authors<sup>36</sup>, is also present in the expressions χόνδρος γάλακτι κατανεμιμένος (porridge washed in the milk), which we find in Pherecrates<sup>37</sup>, and in the *lacte gallinaceum* of Petronius’ *Satyricon*<sup>38</sup>. In the paroemiographer Diogenianus, we read the following explanation<sup>39</sup>: Γάλα ὀρνίθων· ἐπὶ τῶν σπανίων (“milk of birds: use for rarities”). It ought to be a delectable foodstuff. In an inscription, an honorific decree for the *prytanis* Kleanax from Aeolic Cuma, dated between the 2 BC and 2 AD, χονδρόγαλα is mentioned among the foodstuffs which were distributed to free children and slaves and used for a sacrifice<sup>40</sup>.

Χόνδρος could evidently be preserved in large quantities before being “revitalized” (especially with water or milk and flavored with honey) and used at an opportune moment, especially, e.g., during a journey, as already occurred in a very ancient period.<sup>41</sup> A Michigan papyrus (*P.Mich.* I 2, dated

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30 TM 5796.

31 TM 30215.

32 But there is no lack of attestations of products obtained with wine, oil, and salt.

33 Kock II 195 (= *Athenaeus* XII 553 = Fr. 90 Hunter).

34 Hunter 2004, ad loc.

35 Ἐν δὲ Προκρίδι λέγει τις πῶς δεῖ ἐπιμελεῖσθαι τοῦ τῆς Προκρίδος κυνὸς ὡς περὶ ἀνθρώπου τοῦ κυνὸς τὸν λόγον ποιούμενος· οὐκ οὖν ὑποστορεῖτε μαλακῶς τῷ κυνί; κάτω μὲν ὑποβαλεῖτε τῶν Μιλησίων ἐρίων, ἄνωθεν δ' ἐπιβαλεῖτε ξυστίδα. {B.} Ἄπολλον. {A.} εἶτα χόνδρον αὐτῷ δεύσετε γάλακτι χηνός. {B.} Ἡράκλεις.

36 For the occurrences, see Tosi 1991, 341.

37 113, 18 (Kock I 174 = *Athenaeus* VI 269a).

38 XXXVIII 1.

39 III 92 Lelli.

40 SEG XXXII 1243, l. 36.

41 We have evidence for the use of a product similar to χόνδρος in the third Sumerian dynasty at UR (3rd millennium BC); it was given to messengers and consumed in a liquid or semi-liquid form (see Milano 1993).

to 259 BC<sup>42</sup>) carries a list of foodstuffs for a voyage to Syria, and five artabas of χόνδρος appear alongside oil, wine, and honey. This document stems from the famous Archive of Zeno, who was οἰκονόμος, manager of the estates of Apollonius, who was in turn διοικετής—an office equivalent to what we would today call the minister of finance— of Ptolemy II Philadelphus, king of Egypt (260-240 BC), and served the king in various places, predominately at Philadelphia. The citation of five artabas (about 200 liters) indicates that χόνδρος itself probably constituted the privileged foodstuff for enduring long voyages. As Antonino Pollio has shown, the seeds, once treated with boiling water and dried in the sun, furnished a preparation which could be conserved for a long time, and then rendered edible later. Furthermore, it provided sufficient calories quickly. For this reason, porridge could be easily conserved and used on board ships, where it was not possible to eat fresh foods at all times.

In this direction, we hold that this is the meaning of χόνδρος in a papyrus conserved at Cairo, which also stems from the Archive of Zeno (*P.Cair. Zen.* I 59013, dated to 259 BC).<sup>43</sup> This text is an accounting of transport costs<sup>44</sup>: the list includes important goods, imported by Heracleides<sup>45</sup> for Apollonius, and other articles. The transport tax on goods (φόρετρον) was in all probability the one applied for transit between the port of Lake Mareotis and the harbor at Alexandria. From the crosses in the left margin, we gather that the goods were checked. Of other merchandise, registered even further to the left in smaller handwriting, it is said explicitly that they were not subject to taxation (ἄ οὐκ ἀναφέρει), very probably because they were destined for the use of the sailors. Χόνδρος (of which “a Chian amphora” was noted<sup>46</sup>) figures among this latter group of goods, probably because this foodstuff was easily conserved on board the ship, due to the fact that it does not perish easily, and that it could be used at any time, once soaked in water or milk, as we have seen. Other goods which were transported but not subject to duties were a σηστόν<sup>47</sup> of hazelnuts, a basket of cheese (σφυρίδα

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42 TM 1908.

43 TM 674. This papyrus is a sheet 17 x 13,5 cm in size, published for the first time by Edgar 1925 (*P.Cair. Zen.* I, with reproduction, Pl. III, and palaeographic description). Later, it was republished in the SB III with the number 6780 (see also BL VIII 77; IX 49; XII 48). For images and other informations, see Seider 1990, 315, and Harrauer 2010, Taf. 6 and 180-181.

44 On this helmsman (κυβερνήτης) who reappears in other documents from the archive of Zeno, cf. Pestman 1981, I, IX, 337.

45 He seems to have been the captain of the ship (cf. Kruit and Worp 2000, 84).

46 On these specific types of jars, see the detailed description by Kruit and Worp 2000, 94-97. In particular, these two scholars have noted the relationship of this list with two papyri, which mention the same goods (Kruit and Worp 2000, 84-85; cf. *P.Cair. Zen.* I 59012 and 59014).

47 This term ought to be equivalent to ξέστης (the Roman *sextarius*), a measure of capacity equivalent to half a χοῖνιξ (0.98235 liters).



τυροῦ), a jug of honey (στάμν[ος] μέλιτος; perhaps used to flavor the χόνδρος), combustable material (ἔσχάραν μίαν ἐπίπυρα), and a footstool (δίεδρον).

In this overview, we have tried to demonstrate the great diffusion and the uses of a foodstuff which has not known decline over the centuries of its use. Porridges, due to the easy availability of their materials, the simplicity of their preparations, and their ability to survive for long-term storage, constitute one of the main cereal products, especially the varieties made from the genus *Triticum*.

## References

- Badr, Amr, Karl Müller, Ralf Schäfer-Pregl, Ha El Rabey, Sigi Effgen, H. H. Ibrahim, Carlo Pozzi, Wolfgang Rohde and Francesco Salamini. 2000. "On the origin and domestication history of barley (*Hordeum vulgare*).” *Molecular Biology and Evolution* 17:499–510.
- BL: *Berichtigungsliste der griechischen Papyrusurkunden aus Ägypten* VIII, IX, XII Leiden 1992, 1995, 2009.
- Battaglia, Emanuela. 1989. "Artos." *Il lessico della panificazione nei papiri greci*. Milano: Vita e Pensiero.
- Canali De Rossi, Filippo. 2004. *Iscrizioni dello Estremo Oriente Greco. Un repertorio* ("Inscripfen griechischer Städte aus Kleinasien, 65"). Bonn: Dr. Rudolf Habelt.
- Cohen, Andrew C. 2007. "Barley as a Key Symbol in Early Mesopotamia." In *Ancient Near Eastern Art in Context. Festschrift Irene J. Winter* ("Culture and History of the Ancient Near East 26"), edited by Jack Cheng and Marian H. Feldman, 411-422. Leiden-Boston, Brill.
- Crawford, Dorothy J. 1967. "A Ptolemaic Petition on Stone." *Chronique d'Égypte* 42:355-359.
- Crowther, Alison. 2012. "The differential survival of native starch during cooking and implications for archaeological analyses: a review." *Archaeological and Anthropological Sciences* 4:221–235.
- Edgar, Campbell C. 1925. *Zenon Papyri. Catalogue général des antiquités égyptiennes du Musée du Caire, I*. Cairo.
- Evers, Anthony and Mark Nesbitt. 2006. "Cereals." In *The encyclopedia of seeds: science, technology and uses*, edited by M. Black, J. D. Bewley and P. Halmer, 65-70. Wallingford: CABI.
- Fournet, Jean-Luc. 1989. "Les emprunts du grec à l'égyptien." *Bulletin de la Société de linguistique de Paris* 84.1:55-80.
- Frazer, James G. 1995. *The Golden Bough: A Study in Magic and Religion*. New York: Touchstone Books.
- Harlan, Jack Rodney and Daniel Zohary. 1966. "Distribution of wild wheats and barley." *Science* 153:1074-1080.
- Harrauer, Hermann. 2010. *Handbuch der griechischen Paläographie* ("Bibliothek des Buchwesens 20"). Stuttgart: Anton Hiersemann Verlag.
- Hunter, Richard L. 2004. *Eubulus. The fragments*. Cambridge: Cambridge University Press. 1938<sup>1</sup>.
- Kruit, Nico, and Klaas A. Worp. 2000. "Geographical Jar Names: Towards a Multi-Disciplinary Approach." *Archiv für Papyrusforschung und verwandte Gebiete* 46.2:65-146.

- Matijašić, Ivan. 2011. "Su un frammento di collocazione incerta di Ellanico di Lesbo: FGrHist 4 F 192." *Revue de philologie, de littérature et d'histoire anciennes* 1, Tome 85:139-147.
- Milano, Lucio. 1993. "Mehl." *Reallexikon der Assyriologie* 8:22-31.
- Morrell, L. Peter, and Michel T. Clegg. 2007. "Genetic evidence for a second domestication of barley (*Hordeum vulgare*) east of the Fertile Crescent." *Proceedings of the National Academy of Sciences of the United States of America* 104:3289-3294.
- Oliveira, Hugo Raphael, Huw Jones, Fiona Leigh, Diane Lorraine Lister, Martin K. Jones and Leonor Peña-Chocarro. 2011. "Phylogeography of einkorn landraces in the Mediterranean basin and Central Europe: population structure and cultivation history." *Archaeological and Anthropological Sciences* 3:327-341.
- Özkan Hakan, Andrea Brandolini, Ralf Schäfer-Pregl and Francesco Salamini. 2002. "AFLP Analysis of a Collection of Tetraploid Wheats Indicates the Origin of Emmer and Hard Wheat Domestication in Southeast Turkey." *Molecular Biology and Evolution* 19:1797-1801.
- Pestman, Pieter W. 1981 (ed.), *A Guide to the Zenon Archive (P.L.Bat. 21), Pap.Lugd.Bat. XXI A-B*. Leiden: Brill.
- Piperno, Dolores R., Ehud Weiss, Irene Holst, and Dani Nadel. 2004. "Processing of wild cereal grains in the Upper Palaeolithic revealed by starch grain analysis." *Nature* 430:670-673.
- Salamini, Francesco, Hakan Özkan, Andrea Brandolini, Ralf Schäfer-Pregl, and William Martin. 2002. "Genetics and geography of wild cereal domestication in the Near East." *Nature Reviews Genetics* 3:429-441.
- Sarpaki, Anaya. 2009. "Harvest Rites and Corn Dollies in the Bronze Age Aegean." *Hesperia Supplements*, 42, *Essays on Ritual and Cult in Crete in Honor of Geraldine C. Gesell*: 59-67.
- SB: *Sammelbuch griechischer Urkunden aus Ägypten* III, Berlin and Leipzig 1926-1927.
- SEG: *Supplementum Epigraphicum Graecum*. Leiden: Brill 1982.
- Seider, Richard. 1990. *Paläographie der griechischen Papyri, III*. Stuttgart: Hiersemann.
- Shewry, Peter R. 2009. "Wheat." *Journal of Experimental Botany* 60.6:1537-1553.
- Spaeth Stanley, Barbette. 1994. "The Goddess Ceres in the Ara Pacis Augustae and the Carthage Relief." *American Journal of Archaeology* 77:65-100.
- Tester, Richard F., John Karkalas, and Xin Qi. 2004. "Starch-composition, fine structure and architecture." *Journal of Cereal Science* 39.2:151-165.
- Tosi, Renzo. 1991. *Dizionario delle sentenze latine e greche*. Milano: Rizzoli.
- Valamoti Soultana, Maria and Konstantinos Kotsakis. 2007. "Transitions to agriculture in the Aegean: the archaeobotanical evidence". In *The Origins and Spread of Domestic Plants in Southwest Asia and Europe*, edited by Sue Colledge and James Conolly, 75-91. London: University College London Institute of Archaeology Publications.

- Valamoti Sultana, Maria. 2011. "Ground cereal food preparations from Greece: the prehistory and modern survival of traditional Mediterranean 'fast foods'." *Archaeological and Anthropological Sciences* 3:19-39.
- Walters, Peter. 1973. *The Text of the Septuagint. Its Corruptions and Their Emendation*, edited by David W. Gooding. Cambridge: Cambridge University Press.
- Zeeman, Samuel C., Jens Kossmann and Alison M. Smith. 2010. "Starch: its metabolism, evolution, and biotechnological modification in plants." *Annual Review of Plant Biology* 61:209-234.

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Gianluca Del Mastro is Assistant Professor in Papyrology at the University of Naples. He was educated and has specialized in the humanities and is occupied with the study of ancient manuscripts, archaeology, the history of Classical scholarship, and digital humanities, especially in the field of cultural heritage. He received an MA in Multimedia and Cultural Heritage (Naples-Zernike Science Park, Groeningen, Holland) and participates as a member in several projects. He studies the production and diffusion of ancient manuscripts in the Mediterranean Basin, especially in Campania. He has received awards for research on ancient texts and on the textual history of ancient texts. His creation and management of databases, digital books, and other digital tools permits him to plan and create other such instruments for every variety of cultural asset. He was a visiting scholar at Brigham Young University (Provo, Utah) in 2003 and received his PhD in Greek and Latin Philology. Between 2007-8 he was *ricercatore* at ILIESI-CNR. His specific area of specialization is papyrology (he did additional coursework at University College London). He has published about 70 academic works (a list is available at <https://www.docenti.unina.it>) and has worked on the restoration and edition of both Graeco-Egyptian and Herculaneum papyri, publishing papyri from many collections and especially Herculaneum papyri, whose restoration he has also participated in. Further, he has planned the restoration of the Derveni papyrus, which is preserved at the Museum of Thessaloniki. He participates in the Université Paris - Sorbonne and CNRS project for the study of the Herculaneum papyri given to Napoleon and conserved in Paris. He is the editor of the *Thesaurus Herculaneusium Voluminum* and of *Χάρτης, Catalogo Multimediale dei Papiri Ercolanesi*.

Antonino Pollio is a graduated in Biology from the University Federico II of Naples. From 1984 to 1989, he worked as a visiting professor of Botany in the University of Salento, Lecce, Italy. In 1991, he started his career at the Department of Plant Biology of the University Federico II of Naples, and since 1998, he became a professor of Botany at the same University.

Pollio's research is both interdisciplinary and multidisciplinary. His research expertise includes ethnobotany and history of plant uses in Antiquity, and he has paid a special attention to the medicinal plants quoted in the so called Corpus Hippocraticum, and in other Ancient and Medieval texts. In collaboration with A. De Natale and G.B. Pezzatti, he has built a relational ethnobotanical databases of the Campania region (Southern Italy) on the basis of information gathered from different historical sources, including diaries, travel accounts, and treatises on medicinal plants, written by explorers, botanists, physicians, who travelled in Campania during the last three centuries. Moreover, ethnobotanical uses described in historical herbal collections and in Ancient and Medieval texts from the Mediterranean Region have been included in the database. He has also devoted studies on some distinguished physicians and botanists of XVI and XVIII century, as Prospero Alpini and Jacob Plenck. Antonino Pollio has also experience working with museums and collections of botanical records.