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Mossakowska-Gaubert, Maria

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A new kind of loom in early Roman Egypt? How iconography could explain (or not) papyrological evidence

Maria Mossakowska-Gaubert

The question of the different kinds of loom used in ancient Egypt is one of the most crucial issues to understanding the evolution of textile production and its technological development in the Nile Valley. However, sources concerning looms (archaeological, iconographic and written) from the Pharaonic era until the Arab medieval period are meagre, and many research questions remain open.¹ This article is an attempt at a new interpretation of some evidence, particularly iconographic and papyrological, which could add new data to the study of weaving looms used in Egypt of the early Roman period (1st–2nd century AD).

Looms in ancient Egypt – an overview²

The current state of research suggests that the horizontal loom, known as early as the Neolithic period, is the oldest type of loom used in Egypt. In this loom, the warp is mounted horizontally between two beams and is held in

tension by pegs in the ground. The weaver kneels and has to move forward as the fabric progresses, either sitting beside the tissue, or perhaps on it.

It is generally considered that the vertical two-beam loom was introduced into Egypt during the New Kingdom and partly replaced the ground loom. In this loom the warp is held in tension between two beams fixed in an upright frame. According to Gillian Vogelsang-Eastwood's interpretation, the tension of the warp was controlled by turning or lowering a movable cross-beam.³ The weaver was seated when starting, but as the work progressed, he/she had to stand in front of the loom.

It seems that in Roman times a new version of the two-beam loom appears in Egypt.⁴ Analyses of archaeological textiles from Egypt, iconographic material from the western part of the Roman Empire,⁵ as well as ethnographic evidence, have led Martin Ciszuk and Lena Hammarlund to conclude that the Roman two-beam loom had both beams

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1. For studies laying out the current state of research on this topic, see:
Archaeological and iconographic evidence (from the Pharaonic to the Byzantine period): Kamp & Vogelsang-Eastwood 2001; Ciszuk & Hammarlund 2008; Sigl 2016; Sigl 2020.
Papyrological documentation (Hellenistic and Roman periods): Wpiszycka 1965, especially p. 48–54; Droß-Krüpe 2011, especially p. 38–42.
2. See also the article by Johanna Sigl, in this volume (Sigl 2020).
3. Vogelsang-Eastwood 2000, p. 277–278; Kamp & Vogelsang-Eastwood 2001, p. 405–426, especially p. 413. However, M. Ciszuk and L. Hammarlund are more reserved about this issue and consider that “the depictions do not allow any secure conclusions about how the warp was mounted or the shedding mechanism constructed” (Ciszuk & Hammarlund 2008, p. 125).
4. I would like to thank Anne Kwaspen for discussing this topic with me and for her valuable technical remarks about the Roman loom.
5. Based mainly on John-Peter Wild's study (Wild 1992).



Figure 1a. Tunic found in a sarcophagus excavated at Sakkara in 1922, now preserved in the Egyptian Museum, Cairo (JE 59117), side B (2nd century AD). (Photo: Ahmed Amin © Egyptian Museum, Cairo).

revolving, and the warp fastened with a twined starting cord.⁶ The weaver could be seated throughout the weaving process.

Following the results of Johanna Sigl's research,⁷ one can suppose that at least from the 6th century AD a vertical loom, which use require a special pit, was known in Egypt. However, it has not yet been determined whether this loom had a simple warp, or a tubular warp (two-beam and/or three-beam loom): most likely, looms of various kinds were used in these 'loom-pits'.

As regards the warp-weighted loom, it was in use on sites where a non-Egyptian population was dominant: those founded by Greeks in the Ptolemaic period or constructed by the army during the Roman era. It could be also connected with the local production of cotton fabric – in Kharga and Dakhleh Oasis as well in Nubia, – the only regions in Egypt where cotton grew at least from the 2nd

century AD.⁸ In the warp-weighted loom, the warp is fixed to the upper beam and is held in tension by loom weights. The weaver works most of the time standing at the loom.

Finally, the tablet loom, well known during the Roman and Byzantine eras, has been already used in Egypt at the beginning of the 1st millennium BC, or perhaps even in earlier period.⁹ It is small, ease to carry and can be set up anywhere.

It is obvious that at various epochs several kinds of weaving loom could be used simultaneously: the introduction of a new type of loom did not exclude the use of older loom models and versions.

The loom in iconography: missed evidence from Roman Egypt

It is surprising to note that the only representation of a loom identified until now from Roman Egypt does not

6. Ciszuk & Hammarlund 2008, p. 125. However, according to E. Broudy's interpretation, "the top beam of the Roman loom probably did not revolve but could be lowered though slots in the uprights as the weaving progressed and was wound on the lower beam" (Broudy 1979, p. 47).

7. Sigl 2016; Sigl 2020.

8. See especially Wild *et al.* 2008, p. 144. About cotton in Egypt see also Gradel *et al.* 2012, and the article by Fleur Letellier-Willemin, in this volume (Letellier-Willemin 2020).

9. Broudy 1979, p. 31.



Figure 1b. Tunic from Sakkara (JE 59117), side B: depiction of Isis weaving (detail). (Photo: Ahmed Amin © Egyptian Museum, Cairo).

represent a two-beam loom, a ground loom, a warp-weighted loom, or even a tablet loom. Moreover, this evidence has never been cited in studies concerning weaving or, in general, textiles from Egypt.

The depiction of a loom is visible on a painted tunic found in Saqqara and dated probably from the 2nd century AD (fig. 1a).¹⁰ One can recognize the goddess Isis sitting on a chair. As noted by Ewa Laskowska-Kusztal, and



Figures 2a and 2b. Sakata boy, Zaire, weaving raffia cloth using a footstrap loom. (Photos: Philippe Tits, member of Joseph Maes' mission to the Belgian Congo (1913-1914) © Royal Museum for Central Africa, Tervuren).

then Françoise Labrique, Isis is weaving: she passes thread with her left hand, and her left foot, placed on a support, seems to be attached to the warp (fig. 1b). E. Laskowska-Kusztal, and then Fr. Labrique, equated this unusual gesture with the action of a weaver from Niger: he is sitting on the ground and the tension of the warp is held by the back strap.¹¹ The weaver is operating the warp with his foot. However, this interpretation does not seem to be convincing: the gestures and posture of Isis are not the same as those of the weaver from Niger, and the position of the loom is completely different.

To find another parallel for the loom represented on the tunic from Sakkara, I have also resorted to ethno-

10. On this tunic, see especially Laskowska-Kusztal 1997 and Labrique 2015; cf. also Labrique & Papadopoulou 2012.

11. Labrique 2015, p. 218, fig. 1.

graphic material. It seems that the posture of Isis, as well as the loom construction, corresponds much better to the way of weaving on a foot-strap loom. This kind of loom can be seen, for example, in photographs of a Sakata boy from Zaire who is weaving raffia cloth (fig. 2).¹² In the foot-strap loom the warp is stretch between two parallel beams, the framework is set at an oblique angle, and the warp is kept in tension by the weaver with one or both feet. In this loom there is a single-heddle shedding device.

Looms in Roman papyrological evidence: an attempt at a new interpretation

Greek vocabulary concerning weavers and their looms attested in papyrological documentation from the Roman period is varied, and many of the terms and expressions are ambiguous.

Regarding the first two centuries AD, it is commonly admitted that the word γέρδιος is a general term for a weaver, and it has completely supplanted the term ὑφάντης used in the Ptolemaic period.¹³ However, the term γέρδιος was already in use in the 2nd century BC¹⁴ although we do not know the exact difference in meaning between the two terms.¹⁵ It seems that the craft of specialised linen weavers, attested in Ptolemaic as well as in Roman times, and called λινύφορος / λινούφορος, λινούφικος, λινοπλόκος, βυσσουργός, was not connected to any specific loom, but rather to the way of weaving the warp threads which determines the look of textile.¹⁶

Regarding vocabulary connected to the loom, the word ἰστός in the Roman period keeps the ambiguity already

attested in the Hellenistic period, and besides being a loom, it could specify a piece of textile, probably referring to its rectangular shape. Nevertheless, in many texts the term ἰστός is accompanied by other designations, such as γερδιακός, ἐνοίκιος, ἐπικάρσιος, or the context of the documents makes the meaning of word ἰστός more specific. In addition, some new specialised terms for the weaver's craft, especially γερδική τέχνη and λινυφική τῶν καθημένων τέχνη, are mentioned in apprenticeship contracts and they could be related to work on a specific loom.

Looms

ἰστός (*histos*)

Many sales agreements for looms were noted by the record office (*grapheion*) at Tebtynis (Fayyum Oasis) between AD 42 and 47. Seventeen of these contracts concern an ἰστός,¹⁷ and one of them refers to an ἰστός γερδιακός.¹⁸ However, it is not obvious if this distinction is deliberate and reflects different types of loom, or whether ἰστός is only a short version of the expression ἰστός γερδιακός.¹⁹ These documents record administrative fees for sales agreements, but unfortunately do not provide any description of the looms. Whereas one of the contracts notes the price of an ἰστός as 24 drachmas,²⁰ another one concerns a contract "for nursing (a slave child) and for a loan of 12 drachmas and 2 *keramia* of wine, for a total of 16 silver drachmas. (Fee:) 4 obols. For this (loan), a loom (ἰστός) has been given as security".²¹ It could therefore be supposed that the loom, referred to in this document as a guarantee, is worth at least 16 silver drachmas. The difference in price for the ἰστός indicated in the two documents is remarkable,

12. Picton & Mack 1989, p. 47 and 88.

13. Cf. Wipszycka 1965, p. 103; Ruffing 2008, p. 470–487; Droß-Krüpe 2011, p. 58–86.

14. For example, *P. Tebt.* I 16, 48 (2nd century BC).

15. Maybe the appearance of the term γέρδιος was connected with an increasing use in Egypt of a specific loom: the vertical two-beam loom? and the need to distinguish weavers working on this loom from other weavers, which used a ground loom and/or a warp-weighted loom? A lack of proof means that this interpretation remains hypothetical.

16. About these specialised weavers, cf. Wipszycka 1965, p. 103–110; Ruffing 2008, p. 466–468, 640–647; Droß-Krüpe 2011, p. 93–102.

17. *P. Mich.* II 123 *recto*, col II, 20, col. III, 19, col. VII 18, col. VIII 29, col. XI 5, col. XIV 12, 15, 26, col. XV 13, 24, col. XVI 10 (AD 45–46); *P. Mich.* II 125, 10 (AD 45); *P. Mich.* II 128, III 6, 21 (AD 46–47); *P. Mich.* V 240, 27, 41 (AD 46–47).

18. *P. Mich.* II 121 *verso*, col. VII, 3 (AD 42).

19. For this last option, see Wipszycka 1965, p. 52 and Droß-Krüpe 2015, p. 148. Nevertheless, because of all this ambiguity, the expression ἰστός γερδιακός will be presented in a separate chapter.

20. *P. Mich.* II 123 *recto*, col. XIV 26.

21. *P. Mich.* V 240, 64–65 (AD 46–47): English translation by the editors of this text: E.M. Husselman, A.E.R. Boak and W.F. Edgerton.

but we do not know if it is related to different kinds of loom, to their dimensions or perhaps to their condition. **ἰστός γερδιακός** (*histos gerdiakos*)

Many papyrological documents refer to the sale or rent of a loom called ἰστός γερδιακός.²² Some of them contain detailed description of the loom or its price. In the contract of sale of a loom to the weaver Tryphon from Oxyrhynchus, concluded in AD 54 (*P. Oxy.* II 264, 3), the seller Ammonios specifies “I agree that I have sold to you the weaver’s loom (ἰστόν γερδι[ακόν] belonging to me, measuring three weaver’s cubits less two palms, and containing two cross-beams (ἀντία) and two upright beams (ἰστόποδες) and one ἐπίμητρον”.²³ This loom was sold for 20 silver drachmas.

A similar description of a loom is found in a rental contract (*P. Oxy.* XXXVI 2773, 11-14; AD 82): “I concede you the use of weaver’s loom (ἰστός γερδιακός) which we possess measuring 3 cubits less 2 palms, comprising 2 cross-beams (ἀντία), 2 upright beams (ἰστόποδες) and one ἐπίμητρον”.²⁴

The same kind of loom, but larger in size, is described in a sales contract dated to AD 101 (*P. Oxy.Hels.* 34, 2-9): “I agree that I have sold you the weaver’s loom belonging to me, containing two cross-beams (ἀντία), two upright beams (ἰστόποδες), and one ἐπίμητρον, the measurements of the two cross-beams being three and a half cubits for the one, and three cubits and ten digits for other”.²⁵ This loom was sold for 28 silver drachmas.

Two terms that are used in the above descriptions of looms need a comment. The first one is ἀντίον, the word used in classical Greek texts for an upper cross-beam in the warp-weighted loom.²⁶ As Maarit Kaimio remarks in her publication of *P. Oxy.Hels.* 34, it seems probable that in the case of a two-beam loom “the lower beam also bore

the same name”.²⁷ Bernard P. Grenfell and Arthur S. Hunt, as well as Ursula Schlag, in their editions of the documents from Oxyrhynchus, had translated the term ἀντία as “rollers”,²⁸ making, without doubt, a reference to the movement of the upper cross-beam in the warp-weighted loom.²⁹ This interpretation fits well with what we know about the Roman version of the two-beam loom with revolving beams. The meaning of the second term, ἐπίμητρον, has been also analysed by M. Kaimio and she identified it in a convincing manner as a “heddle rod”.³⁰

M. Kaimio notes in her publication of *P. Oxy.Hels.* 34 that the measurement of the loom indicated in all these documents is probably the length of the cross-beams.³¹ Although a calculation of the weaver’s cubit used in the Roman period is still an open question, Antoine Pierre Hirsch in his PhD dissertation remarks, regarding cloth-weaver cubits mentioned in Ptolemaic and Roman period texts, that we do not know which cubit system was involved.³² According to his interpretation of the metrological papyrus from Oxyrhynchus (*P. Oxy.* IV, 669; AD 285-287), the value of the weaver’s cubit can vary from 37.5 cm to 43.75 cm.³³ So, we can approximately calculate the width of the looms mentioned in *P. Oxy.* II 264 and *P. Oxy.* XXXVI 2773 as between 97.5 cm and 113.75 cm. The cross-beams of the loom from *P. Oxy.Hels.* 34 had slightly different lengths: the first one between 131.25 cm and 153.12 cm, and the second one between 130.5 cm and 152.25 cm. Taking the dimensions of these looms into consideration, we can suppose that they were used to weave “Roman-style” tunics made of two rectangular pieces of fabric sewn together,³⁴ or to manufacture shawls, veils or furnishing textiles.

22. γερδιακός ἰστός in documents from the 1st and 2nd centuries AD: *P. Oxy.* II 367 (AD 25); *P. Mich.* II 121 verso, col. VII, 3 (AD 42); *P. Oxy.* XXXVI 2773 (AD 82); *P. Oxy.* II 264, 3 (AD 54); *P. Oxy.Hels.* 34 (AD 101); *P. Oxy.* III 646 (AD 117-138); *P. Oxy.* X 1269 (AD 101-125); *SPP* XXII 40 (AD 150).

23. Translation by editors B.P. Grenfell, A.S. Hunt (*P. Oxy.* II, p. 235) with my modifications.

24. Translation by editor U. Schlag (*P. Oxy.* XXXVI, p. 66) with my modifications.

25. Translation by editor M. Kaimio (*P. Oxy.Hels.* p. 127) with my modifications.

26. For example: Aristophanes, *Thesmophoriazousae*, 822.

27. *P. Oxy.Hels.* p. 128.

28. *P. Oxy.* II, p. 235; *P. Oxy.* XXXVI, p. 66.

29. Cf. Broudy 1979, p. 23-25; Ciszuk & Hammarlund 2008, p. 122.

30. *P. Oxy.Hels.* p. 128-129.

31. *Loc. cit.*

32. Hirsch 2013, p. 96.

33. *Ibid.*, table 23, p. 84. The weaver’s cubit mentioned in *P. Oxy.* IV 669 contained most likely five palms, so depending on the cubit system, one palm equals 7.5 cm to 8.75 cm. One palm was divided in four fingers, from 1.8 cm to 2.1 cm.

34. About tunics used in Egypt at the Roman period, see Mossakowska-Gaubert 2017.

ἰστός τῶν ἐπικαρσίων (*histos tōn epikarsiōn*)

The expression ἰστός τῶν ἐπικαρσίων appears only once in the papyrological documentation (*P. Oxy.* XLII 3062, 3-4, 1st century AD) and it seems to be related to the manufacture of fabrics called ἐπικάρσια in documents from the Roman and Byzantine periods. The papyrological evidence of these terms has recently been studied by Kerstin Droß-Krüpe³⁵ and she concludes, in a convincing way, that textiles called ἐπικάρσια might be interpreted as “chequered garments”, produced by any weaving technique. The ἰστός τῶν ἐπικαρσίων seems to be a special loom enabling the weavers to produce more complex types of check pattern fabrics, such as twill or diamond twill: according to K. Droß-Krüpe it was probably a two-beam loom with two or more shed sticks. We would add that it could also be a warp-weighted loom with three heddle rods.³⁶

ἐνοίκιος ἰστός (*enoikios histos*)

The looms mentioned in the documents cited above were most likely used by professional weavers, however, looms were also used for domestic purposes. One of the documents from the Roman period (*P. Oxy.* XIV 1737, 8, 22, 42; 2nd–3rd century AD) relates directly to a “house loom” (ἐνοίκιος ἰστός). It is not clear what kind of loom is referred to in this document, perhaps a simple ground loom?

The weaver’s craft**γερδική τέχνη** (*gerdikê technê*)

In the Roman era documents we find numerous apprenticeship contracts (*didaskalikai* or *cheirographai*) for the “weaver’s craft”, γερδική τέχνη.³⁷ These contracts contain detailed agreements concerning the financial conditions of training, accommodation etc., but they do not mention any type of weaving loom or other technical information about the skills to be learned. Most frequently the apprenticeship lasts from one to three years,³⁸ though some contracts

concern a training period of four³⁹ or five years.⁴⁰ It seems that in the case of longer contracts, after two or three years of apprenticeship, a trainee became a journeyman to the master, and got a salary. It is not however clear why the duration of training is so variable. On the one hand, we have no proof that an apprentice learned only in one workshop, and on the other, it might be that he/she already had some weaving experience so his/her training could be shorter than that of a beginner. Nevertheless, it seems that three years was enough time for a basic training in the γερδική τέχνη, and five years for becoming a specialised weaver. In comparison with other professional trainings, it seems a quiet long period,⁴¹ which would be proof of high specialisation of the required skills.

λινυφική τῶν καθημένων τέχνη (*linyphikê tōn kathêmenōn technê*)

A contract of apprenticeship (*cheirographon*) registered in *P. Fouad* 37 (AD 48), between a weaver named Menodorus and a certain Fuscus, concerns teaching, over two years “the craft of the seated linen weavers” (l. 4): [...] ἐγδιδάξει τὴν λινυφικὴν τῶν καθημένων τέχνην [...]. The trainee is to receive payment during training of 48 drachmas each year.

In her book of 1965, Ewa Wipszycka was the first to pay attention to the exceptional feature of this document, clearly concerning some new technological concept.⁴² She interpreted it as proof of the use of an improved version of the horizontal loom, probably with the raised pegs, allowing the weaver to sit when using the loom. She excluded the idea that this contract involved a two-beam vertical loom used since the Pharaonic period, because in the case of such a loom the weaver was seated only when starting the work. In addition, this loom had been known in Egypt from a long time, and it would not be necessary to specify in a contract that the weaver is sitting during a part of his/her work.

35. Droß-Krüpe, 2015, p. 149; Droß-Krüpe 2018.

36. About the technological possibilities of the use of warp-weighted looms, cf. Ciszuk & Hammarlund 2008, p. 122.

37. About apprenticeship contracts, see Bergamasco 1995, in particular for weavers: Wipszycka 1965, p. 57–63; Droß-Krüpe 2011, p. 103–120 (for an exhaustive list of contracts from the 1st to the 3rd century AD, see a table, p. 104–105).

38. Documents from 1st to 2nd century AD: *P. Tebt.* II, 384, 4–5 (AD 10); *P. Mich.* V, 346b–c (AD 12–13); *P. Oxy.* II 322 (AD 36) [= SB X 10236]; *P. Mich.* III, 170, 7 (AD 49), *P. Wisc.* I 4, 6 (AD 53); *P. Oxy.Hels.* 29 (AD 54); *P. Mich.* III 171, 11 (AD 58); *P. Mich.* III 172, 9–10 (AD 62); *P. Oxy.* II 275, 13 (AD 66); *P. Oxy.* XLI 2971 (AD 66); *SB XXIV* 16253, 9 (AD 97–103); *P. Tebt.* II 385 (AD 117); *SB VI* 9374 (AD 169).

39. *P. Oxy.* XIV 1647 (late 2nd century AD).

40. *P. Mich.* II 121, 2, VIII (AD 42); *P. Oxy.* IV 725 (AD 183).

41. Cf. Bergamasco 1995, see especially a table p. 162–166: he noticed only two cases of six-years training: for a physician as well as for a mason’s craft.

42. Wipszycka 1965, p. 49–50.

Since 1965 many new sources and studies concerning weaving in Egypt have been published, but only Kerstin Droß-Krüpe, in her book of 2011 and then in her article from 2015,⁴³ has mentioned the contract recorded in *P. Fouad 37*. In her opinion, the weaver of this document is working on a two-beam vertical loom.

However, we can suppose that the expression λινυφικὴ τῶν καθημένων τέχνη used in *P. Fouad 37* means that the contract concerns another type of training, and probably another way of weaving and a different type of loom from that used in γερδικὴ τέχνη, so often mentioned in documents from the same period. It is obvious that the weaver working on the loom from *P. Fouad 37* was always seated, but we do not know how and where: on the ground, a bench, a chair, or maybe in a pit? In addition, a salary for the apprentice is to be paid from the first year of training, which seems to be exceptional when compared with other weaver's apprenticeship contracts dated from the 1st century AD. Perhaps this weaving technique was not very complicated and an apprentice quickly became a journeyman.

Final remarks

Greek papyrological documentation from the 1st–2nd centuries AD features a varied vocabulary concerning weaving looms and specialised weavers. Some terms known in the Ptolemaic period disappear, but there are a lot of new ones. This differentiation of vocabulary seems to reflect technological developments and innovations in the domain of weaving.

The term ἰστός continues to be a general word for “loom”, although it may sometimes take a specific meaning, most likely that of any vertical loom: a two-beam loom, without precision as to whether the beams are movable or not, and perhaps a warp-weighted loom also. It could be that the expression ἰστός γερδιακός, which appears in papyrological documents from the beginning of the 1st century AD, relates specifically to a vertical loom with moving beams. If a lexical distinction between the terms ἰστός γερδιακός and ἰστός mentioned in the documents from the record-office at Tebtynis is intended, in this case the term ἰστός was probably related to the “old version” of the two-beam loom. However, we have no data to be able to estimate the extent of the use in the early Roman period of both kinds of two-beam looms. Prices of two-beam looms mentioned in the documentation depended mainly on dimensions of the apparatus.

Another kind of loom also appears in the 1st century AD. This is the ἰστός τῶν ἐπικαρσίων, which was probably a vertical loom with a developed shed rods system, or a warp-weighted loom with three heddle rods, used to produce, for example, diamond twill. We can suppose that the simple horizontal loom, used mainly for domestic purposes in Egypt of the Roman period, was called ἐνοίκιος ἰστός. So far, we cannot identify any specific denomination for a warp-weighted loom, nor for a tablet loom, in the Greek vocabulary used in Egypt in the early Roman era.

The expression γερδικὴ τέχνη probably specifies the craft of a weaver working on any vertical two-beam loom. The lack of apprenticeship contracts concerning weavers specialised in one raw material, such as λινύφος / λινόϋφος, λινουφικός, λينوπλόκος, βυσσουργός, seems to prove that they worked on any kind of loom, most likely a vertical loom, and they received training in γερδικὴ τέχνη. However, apprenticeships in λινυφικὴ τῶν καθημένων τέχνη could be proof of the introduction into Egypt of a new kind of loom to produce linen textiles. It is tempting to connect the loom used by the “seated linen weaver” of *P. Fouad. 37* with a foot-strap loom. This kind of loom could be identified in the representation on the tunic from Sakkara.

All identifications proposed in this article must remain hypothetical, but we hope that new data from papyrological, iconographical and archaeological sources will clarify the issue of looms used in Egypt in the Roman period.

Abbreviations

All papyrological works and all references to papyri, ostraca, etc. follow J.F. Oates, R.S. Bagnall, S.J. Clackson, A.A. O'Brien, J.D. Sosin, T.G. Wilfong & K.A. Worp (eds.), *Checklist of Greek, Latin, Demotic and Coptic Papyri, Ostraca and Tablets*. Available at: https://library.duke.edu/rubenstein/scriptorium/papyrus/texts/clist_papyri.html (continually updated)

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43. Droß-Krüpe 2011, p. 40–41; Droß-Krüpe 2015, p. 148.

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