

# Amphorae in *Sellium* from the first century to the fifth century AD: importation and regional production

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**ABSTRACT** The archaeological excavations done in *Sellium* (central Portugal) revealed the existence of a large number of Roman amphorae of various types and chronologies, and dolia. The chemical characterization of amphorae and dolia pastes was done by neutron activation analysis and the results compared with production centers of *Lusitania* and *Baetica*. The results obtained point to (1) importation of wine and oil amphorae from the Southwest of the Iberian Peninsula (*Baetica*) during the first and

second centuries; importation of fish products and wine amphorae from Tagus basin production centers located near Lisbon since the first till the fifth century AD; and from Peniche since the first century till Augustus/Tiberius times; and (2) a local/regional production including oil, wine and fish products containers, since the first century to the fifth centuries, in agreement with the existence of kilns evidences in the area. Among the *dolia* studied, local productions and importations from the Tagus estuary and *Baetica* were found.

## Introduction

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The Roman town of *Sellium* (Tomar-Portugal), founded by Augustus, between 16-13 BC, was one of the *civitates* of the *Conventus Scallabitanus*, in *Lusitania*.

The archaeological excavations done in *Sellium* revealed the existence of a large number of Roman amphorae (368) of various types and chronologies, and *dolia* (92). The *amphorae* were used to store and transfer wine, olive oil and fish products (Banha et al., 1998; Ponte et al., 1993; Ponte, 1999); the *dolia* also served as containers for oil, wine and cereals. The variety of the amphorae and dolia found in the *Forum*, in the *insulae* and the *macellum* shows a social organization and different rhythms of production, consumption and the routes used for the food diet of the *Sellium*'s community.

The existence of kiln evidences in the area and the significant amount of large containers suggest a local/regional production.

In this work a first chemical characterization of amphorae and dolia pastes found in *Sellium* was performed by means of instrumental neutron activation analysis (INAA). The results obtained for *Sellium* ceramic materials of different chronologies are presented and compared with different production centers in *Lusitania*, namely Peniche, Porto dos Cacos and Quinta do Rouxinol (Tagus estuary) and Herdade do Pinheiro (Sado estuary), and *Baetica* (Cadiz and Guadalquivir) aiming the establishment of their provenance (Dias et al., 2001, 2003; Prudêncio et al., 2003). A contribution to confirm a local/regional production of amphorae and of dolia in *Sellium* is a major objective of this work.

## 2. Materials and methods

The location of *Sellium* (nowadays Tomar) is shown in Fig. 1. The ceramics studied refer to 52 amphorae (A-1 to A-52) and 5 dolia (D-1 to D-5). Typological analysis of amphorae and macroscopic observations of the pastes were done. The typology, chronology and the food product associated to each sample is given in Table 1.

The chemical analysis was performed by instrumental neutron activation analysis (INAA). Samples and standards (sediment

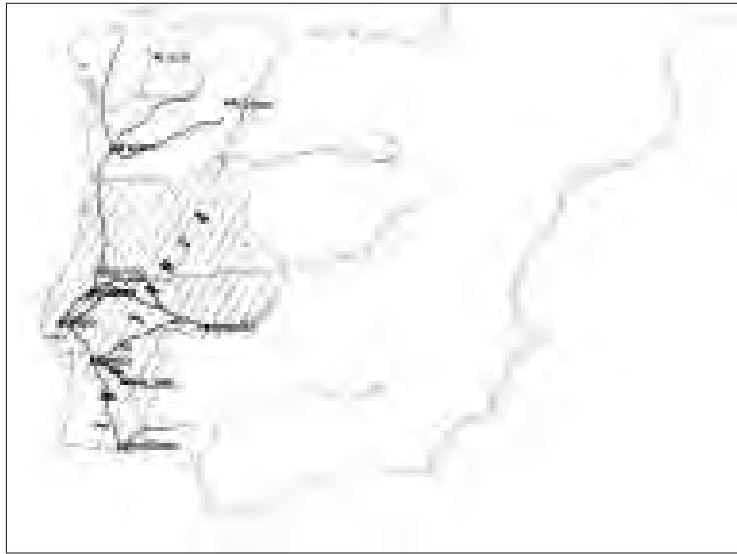


FIG. 1 – Map of the Iberian Peninsula showing *Lusitania* and the location of the *Sellium*.

GSD 9 and soil GSS 1) were irradiated together in the core grid of the Portuguese Research Reactor (Sacavém) at a flux of  $4.4 \times 10^{12} \text{ n cm}^{-2} \text{ s}^{-1}$  for seven hours. Details of this method can be found in Prudêncio et al., 1986 and Dai Kin et al., 1999. The content of the following elements was obtained: Na, K, Fe, Sc, Cr, Co, Zn, Ga, As, Br, Rb, Zr, Sb, Cs, Ba, La, Ce, Nd, Sm, Eu, Tb, Dy, Yb, Lu, Hf, Ta, W, Th, U.

Multivariate statistical methods were employed by using the Statistica program (StatSoft, Inc., 2003; STATISTICA data analysis software system, version 6).

**TABLE 1**

Typology, chronology and food products of the amphorae and dolia studied.

	Typology	Chronology (cent.)	Food product
<i>Amphorae</i>			
A-1	Haltern 70	I	wine
A-2	Haltern 70	I	wine
A-3	Haltern 70	I	wine
A-4	Haltern 70	I	wine
A-5	Lusitana 3	II	wine
A-6	Dressel 2-4 (?)	I	wine
A-7	Pascual 1 (Dressel 1)	I	wine
A-8	Oberaden 81/Haltern 70	I	wine
A-9	Lusitana 3 (Almagro 51a)	II - III	wine
A-10	Oberaden /Haltern 70	I	wine
A-11	Lusitana 3 (Almagro 51a-b)	II	wine
A-12	Gaulish 5	I - II	wine
A-13	Lusitana 3 (Almagro 51a)	II	wine
A-14	Dressel 28	I - II	wine
A-15	Dressel 28	I - II	wine

**TABLE 1 [cont.]**

	Typology	Chronology (cent.)	Food product
A-16	Oberaden /Haltern 70	I	wine
A-17	Pascual 1	I	wine
A-18	Lusitana 3 (Almagro 51a)	II	wine
A-19	Lusitana 3 (Almagro 51a-b)	II	wine
A-20	Lusitana 3	II	wine
A-21	Lusitana 3 (Almagro 51)	II	wine
A-22	Dressel 20B	I - II	oil
A-23	Dressel 20C	I - II	oil
A-24	Dressel 20A	I	oil
A-25	Dressel 23	II - III	oil
A-26	Dressel 25	I - II	oil
A-27	Beltrán 85	I	oil
A-28	Lusitana 4 (Almagro 51c)	III - V	fish products
A-29	Lusitana 3 (Almagro 51b)	III - V	fish products
A-30	Lusitana 2 (Almagro 50)	II/III - V	fish products
A-31	Lusitana 3	III - V	fish products
A-32	Lusitana 4 (Almagro 51c)	III - V	fish products
A-33	Lusitana 1 (Dressel 14)	I - II	fish products
A-34	Lusitana 4	III - V	fish products
A-35	Lusitana 4	III - V	fish products
A-36	Lusitana 4	III - V	fish products
A-37	Lusitana 1 (Dressel 14)	I - II	fish products
A-38	Lusitana 4 (Almagro 51c)	II/III - V	fish products
A-39	Lusitana 4	III - V	fish products
A-40	Lusitana 3 (Almagro 51c)	III - V	fish products
A-41	Lusitana 1 (Dressel 14)	I - II	fish products
A-42	Lusitana 1 (Dressel 14)	I	fish products
A-43	Beltrán I	I - II	fish products
A-44	Lusitana 1 (Dressel 14)	I - II	fish products
A-45	Beltrán I (Dressel 7-11)	I - II	fish products
A-46	Lusitana 3 (Almagro 51b)	III - V	fish products
A-47	Lusitana 1 (Dressel 14)	I - II	fish products
A-48	Lusitana 1 (Dressel 14)	I - II	fish products
A-49	Lusitana 4 (Almagro 51c)	III - V	fish products
A-50	Lusitana 1 (Dressel 14)	I - II	fish products
A-51	Beltrán IIB	I - II	fish products
A-52	Lusitana 1 (Dressel 14)	I - II	fish products
<b>Dolia</b>			
D-1	Dolia	II - III	
D-2	Dolia	II - III	
D-3	Dolia	I	
D-4	Dolia	II - III	
D-5	Dolia	II - III	

### 3. Results and discussion

The chemical characterization of the amphorae and dolia found in *Sellium* revealed significant differences among the ceramic materials studied, confirming the typological and morphological analysis, and pointing to the importation of food products from different sources.

Statistical analysis (cluster analysis using the Euclidean mean distance as similarity coefficient) clearly identified four outliers, 3 amphorae - A-20 (wine), and A-40 and A-49 (fish products) and one dolia (D-1). Also with significant differences in the chemical com-

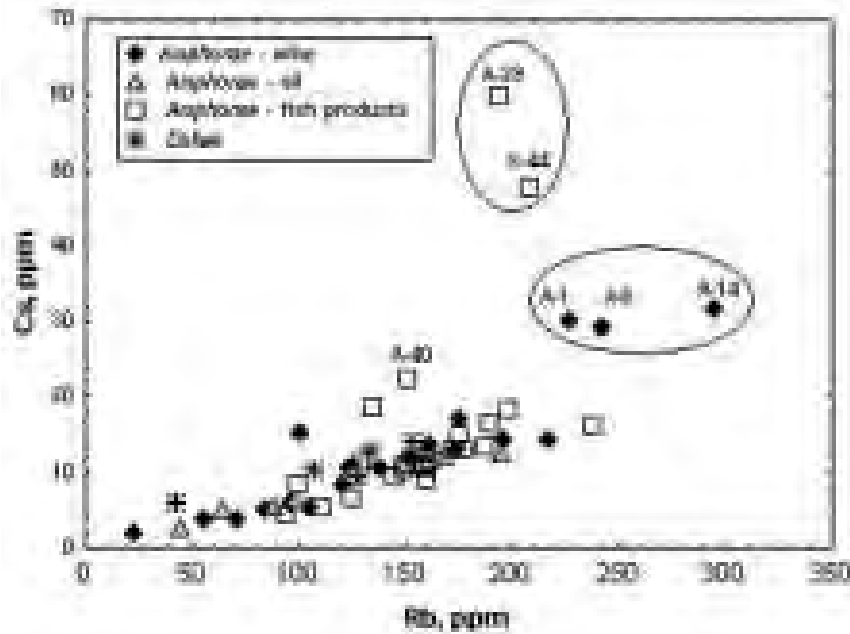


FIG. 2 – Diagram Rb vs. Cs of *Sellium* amphorae and dolia.

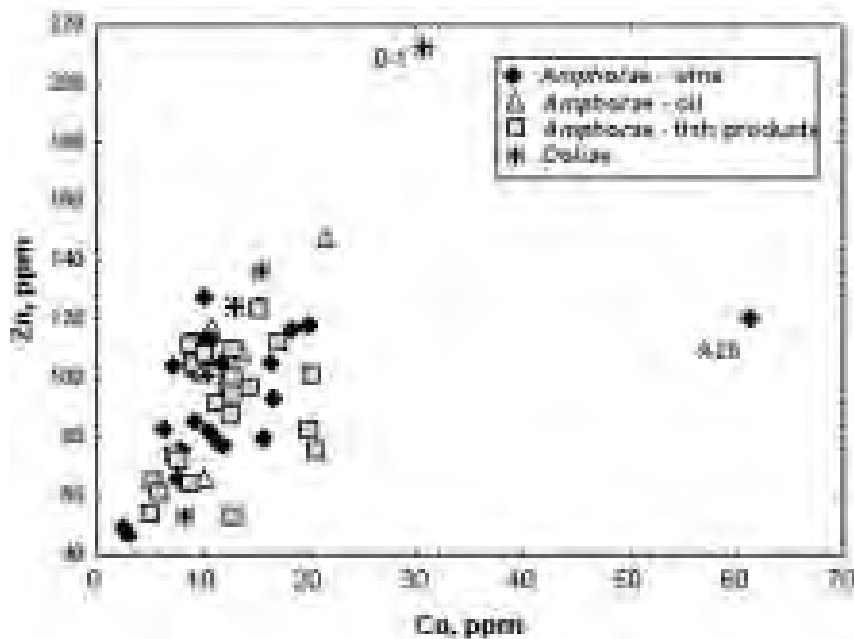


FIG. 3 – Diagram Co vs. Zn of *Sellium* amphorae and dolia.

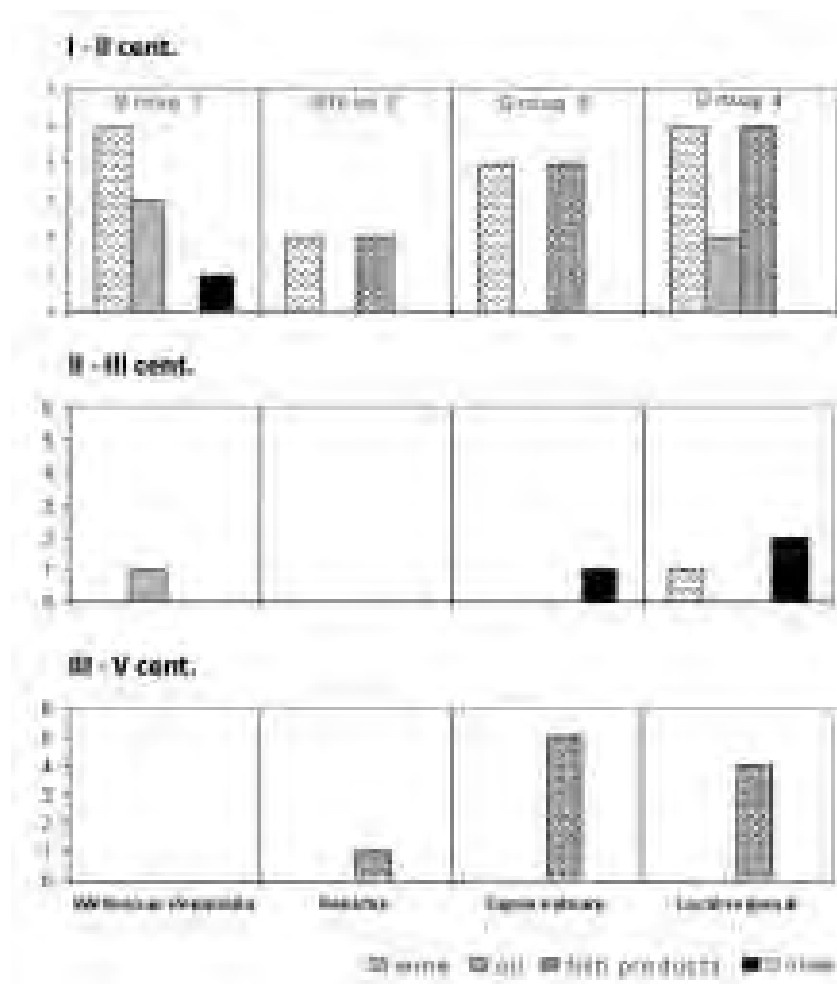


FIG. 4 – Histograms representing the four groups of amphorae and dolia found in *Sellium*, divided by chronology, with the indication of the source area and the food product associated to the amphorae.

position, two groups were found: (1) fish products amphorae A-39 and A-44; and (2) wine amphorae A-1, A-6 and A-14. All these samples remain outliers even when a comparison is made with *amphorae* produced in production centers of *Lusitania* — Tagus river estuary (Porto dos Cacos and Quinta do Rouxinol), in the Sado estuary (Herdade do Pinheiro), and in Peniche, as well as in the southwest Iberian Peninsula, *Baetica*. Some of the differences among the chemical elements contents responsible for the differentiation of the above mentioned samples of the containers found in *Sellium* are shown in Figs. 2 and 3.

A comparative study of the *Sellium* samples (except the outliers) and amphorae from different production centers of *Lusitania* and *Baetica* (ITN database) by using multivariate statistical analyses and geochemical interpretations indicate the existence of four main groups of containers (Fig. 4):

- Group 1 – One group of 10 samples, including four oil amphorae, five wine amphorae and one dolium, with chemical affinities with *Baetica* production centers, pointing to an importation of wine and oil mainly in the first century, and in the second century.
- Group 2 – Five amphorae, two dated from 1-2 centuries associated with wine, and three associated with fish products (two from the 1-2 centuries, and one from the 3-5 centuries), match in composition with Peniche production center.

Group 3 – 13 amphorae and one dolium (from the middle of the first century to the fifth century) are similar to Tagus estuary production centers. Taking into account the typology, five Dressel 14 amphorae (fish products) were most probably produced in Porto dos Cacos (Raposo et al., 1995).

Group 4 – 19 samples, corresponding to oil, wine and fish products amphorae and two dolia, from the first to the fifth centuries, which may correspond to a local/regional production.

Shapes of amphorae samples belonging to these groups are represented in Fig. 5 to 8, respectively.

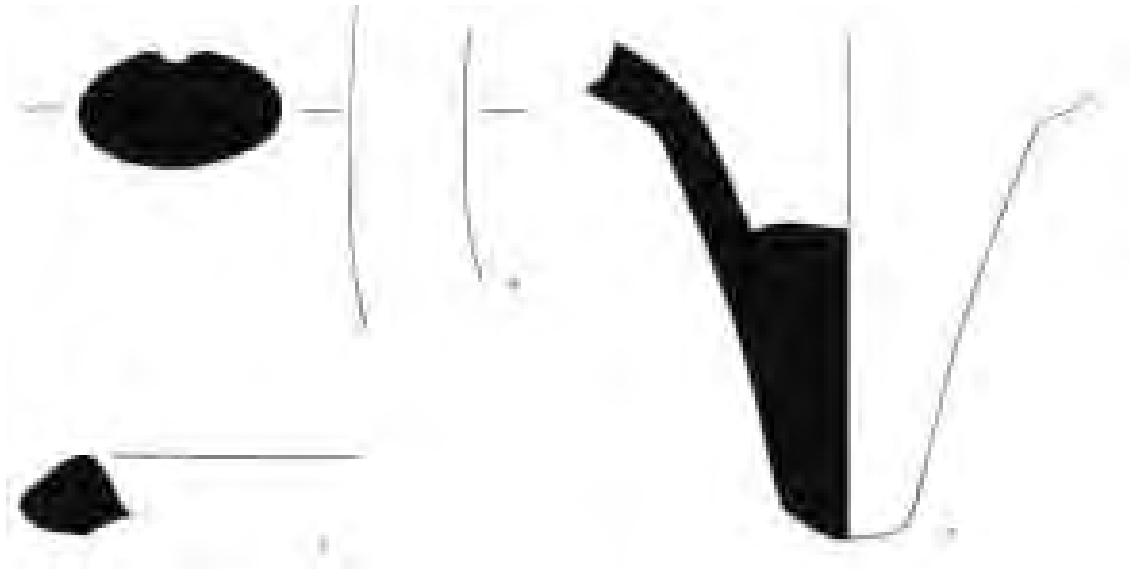


FIG. 5 – Shape of amphorae (Haltern 70) of group 1 (*Baetica*).

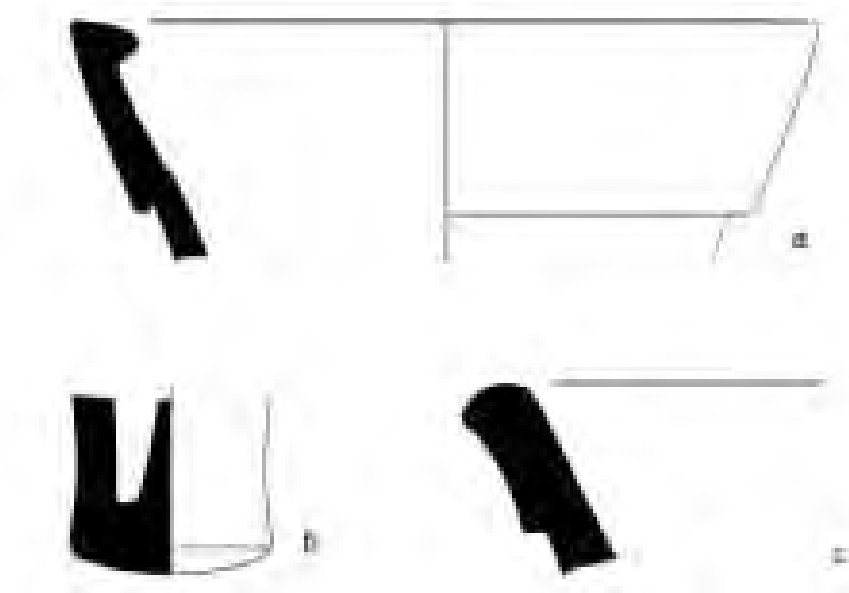


FIG. 6 – Shape of amphorae (a: Pascual; b and c: Beltrán I) of group 2 (*Peniche*).

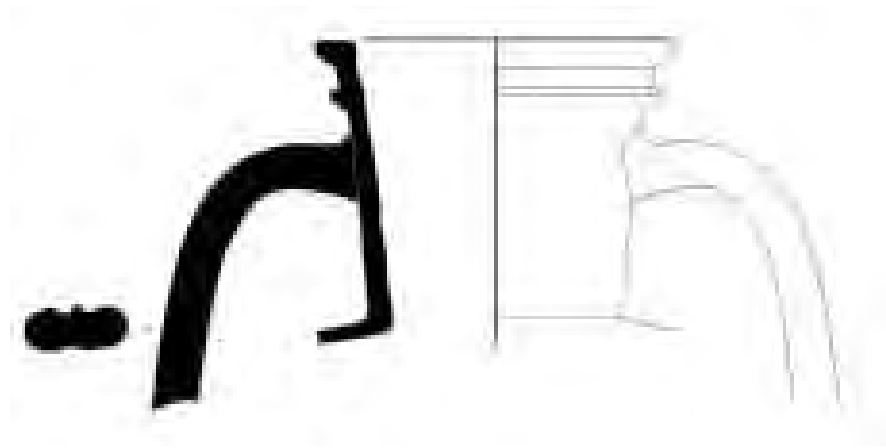


FIG. 7 – Shape of amphorae (Dressel 28) of group 3 (Tagus estuary).



FIG. 8 – Shapes of amphorae (Haltern 70) of group 4 (*Sellium* production?).

As far as the imports are concerned, the results obtained point to: importation of wine and oil amphorae from the southwest of the Iberian Peninsula (*Baetica*) during the first and second centuries; importation of wine and fish products from Peniche mainly during the first and second centuries; importation from *Tagus* estuary production centers of wine amphorae during the first and second centuries, dolia from the first to the third centuries, and fish products from the first to the fifth centuries (Fig. 4).

Among the elements studied, K, Rb, Cs, Th and the Eu anomaly (Fig. 9) are the best fingerprints to distinguish the different origins within the production centers considered in *Lusitania* and southwest Iberian Peninsula.

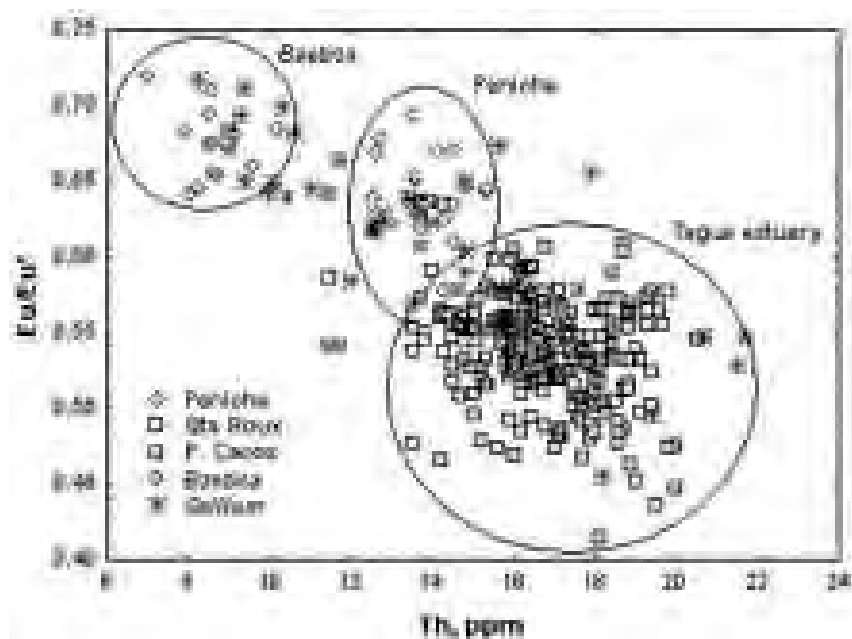


FIG. 9 – Diagram Th vs.  $Eu/Eu^*$  ( $3*[Eu] / [2*[Sm] + [Tb]]$ ) of *Sellium* samples and *amphorae* from production centers of Lusitania and Baetica.

#### 4. Conclusions

The results obtained showed the existence of amphorae and dolia imported from known production centers, a few outliers (unknown origin), and one group composed of a significant number of samples (19) that may correspond to a local production. The “*Sellium* production” includes oil, wine and fish products containers, since the first century to the fifth centuries. Concerning the imports, the results obtained for amphorae point to: (i) wine and oil amphorae from the south of the Iberian Peninsula (*Baetica*) during the first and second centuries; (ii) fish products and wine amphorae from *Tagus* river basin production centers located near Lisbon (Quinta do Rouxinol and Porto dos Cacos) since the first cent till the fifth century; and (iii) wine and fish products amphorae from Peniche since the first century till Augustus/Tiberius times.

The significant number of large containers found in *Sellium*, together with the results obtained in this work enhances the importance of the excavation of kilns in *Sellium* in order to confirm and better characterize the ceramics produced in this Roman town. Also of great importance is a further analysis of a larger number of dolia samples, not only to have a more representative chemical characterization of this type of containers, but also to confirm the hypothesis of a significant local production of dolia for olive oil storage and consumption by the people of the *civitas*, taking into account the small number of oil amphorae found.



## NOTES

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