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Standardization and units of measurement used in pottery production: the case of the post-medieval *botijuela* or Spanish olive jar made in Seville

By MIGUEL BUSTO-ZAPICO

SUMMARY: The aim of this paper is to determine the degree of standardization of pottery production and the units of measure that regulated their production. The group chosen to test this methodology is known as the Spanish olive jar. It is a series of productions manufactured in the south of the Iberian Peninsula throughout the Early Modern Period. The methodology begins with the morphometric characterisation of each vessel around a series of quantitative variables. Then, the Test for Normality is performed, and the Product-Moment Correlation Coefficient is calculated. Subsequently, a Cluster Analysis identifies different groups of Spanish olive jars. The Principal Component Analysis provides additional information that allows for a deeper understanding of the groups obtained. As a final step, calculating the Coefficient of Variation allows us to know the degree of standardization of each variable. Finally, once all these data are known, the possible units of measure that governed the production system of the Spanish olive jar can be recognized.

INTRODUCTION

The standardization or diversity of ceramic types is one type of evidence provided by the archaeological record that allows researchers to form hypotheses regarding the specialization of pottery artisans. In addition to this evidence, the study of ancient ceramics can also offer us information about production structures, processing techniques and scales of production.¹ All these data shed light on larger productive systems and the crafts of making ceramics. But the question remains, how do we measure the diversity of ceramics? The present article will attempt to outline a functional methodology to answer this question.

There are two main aims to this research. The first is to define a methodology that identifies the

standardization and the units of measurement used in the production of some types of ceramics. The second objective is to test the methodology on a specific ceramic type to obtain previously unknown data about it and to verify the viability of the method.

POST-MEDIEVAL PRODUCTIONS OF THE SPANISH OLIVE JAR

The group researched in this paper as a case study consists of 40 specimens of the ceramic class defined by J. M. Goggin² as the Spanish olive jar. These potteries also appear in the archaeological literature under the following labels: *anfora*, *anforeta*, *botija*, *botijuela perulera*, or *botijuela*. The terms *botija*, *botixuela* and *botija perulera* derive from its use and

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ABBREVIATIONS

C	Cluster
CA	Cluster Analysis
CV	Coefficient of Variation
PC	Principal Component
PCA	Principal Component Analysis
SOJ	Spanish olive jar or <i>botijuelas</i>

SUMMARY IN FRENCH, ITALIAN, GERMAN AND SPANISH

RÉSUMÉ

Standardisation et unités de mesures utilisées dans la production de céramique; le cas de la botijuela postmédiévale ou la jarre d'olive espagnole produite à Séville

Cet article vise à déterminer le degré de standardisation de la production de la poterie et les

unités de mesure qui régulent sa production. Legroupe choisi pour tester cette méthodologie est celui des jarres d'olives espagnoles (*botijuela*). C'est une série de productions manufacturées dans le sud de l'île ibérique au début de la période moderne. La méthodologie commence avec la caractérisation morphométrique de chaque poterie autour d'une série de variables quantitatives.

Le Test de Normalité est ensuite réalisé, puis le coefficient de corrélation de Pearson est calculé. Par la suite, une analyse typologique permet d'identifier différents groupes de jarres d'olives espagnoles. L'analyse en composantes principales fournit des informations complémentaires qui apportent une compréhension approfondie des groupes obtenus. En dernière étape, le calcul du Coefficient de Variation nous permet de connaître le degré de standardisation de chaque variable. Enfin, une fois que toutes ces données sont connues, les unités possibles de mesure qui gouvernent le système de production des jarres d'olives espagnoles peut être identifié.

RIASSUNTO

Standardizzazione e unità di misura usate nella produzione di ceramica. Il caso della botijuela post-medievale, ossia l'anfora da olio spagnolo realizzato a Siviglia

Scopo di questo contributo è stabilire il livello di standardizzazione di una produzione ceramica equali unità di misura regolassero la sua realizzazione. La tipologia scelta per testare questa metodologia è nota come anfora spagnola da olio (*botijuela*). Si tratta di una serie di produzioni realizzate nel sud della Penisola Iberica durante la prima età moderna. La metodologia impiegata muove dall'identificazione delle caratteristiche morfologiche di ciascun recipiente considerando una serie di variabili quantitative. Si procede quindi con il test diverifica della normalità e viene calcolato il coefficiente di correlazione lineare. Successivamente, tramite il clustering, si identificano i gruppi di anfore spagnole da olio. L'analisi delle componenti principali fornisce ulteriori informazioni che permettono di comprendere in maniera più approfondita i gruppi così ottenuti. Come passo finale, il calcolo del coefficiente di variazione ci permette di conoscere il livello di standardizzazione di ciascuna variabile. Per concludere, quando tutti questi valori sono noti, è possibile individuare su quali unità di misura si basasse il sistema di produzione delle anfore spagnole da olio.

ZUSAMMENFASSUNG

Standardisierung und Maßeinheiten in der Keramikproduktion. Der Fall des Nach-mittelalterlichen Botijuela oder der spanische Oliven Tiegel gemacht in Sevilla

Das Ziel dieses Artikels ist, den Grad der Standardisierung für die Keramikproduktion und die Maßeinheiten zu bestimmen, die ihre Produktion

regelt. Die Gruppe, die ausgewählt wurde, diese Methode zu testen, ist bekannt unter dem Namen 'das spanische Olivenglas'. Eine Reihe von Produkten sind im Süden der iberischen Halbinsel während der Frühneuzeit hergestellt wurden. Die Methode beginnt mit der morphometrischen Charakterisierung der einzelnen Schiffe, um eine Reihe von quantitativen Variablen zu erstellen. Dann wird der Test auf Normalverteilung ausgeführt, und der Produkt-Moment-Korrelationskoeffizient berechnet. Sobald diese Daten bekannt sind, können schließlich die möglichen Maßeinheiten, die das Produktionssystem des spanischen Oliven Glases bestimmt, anerkennen. Anschließend identifiziert eine Clusteranalyse verschiedene Gruppen von spanischen Oliven Gläser. Die Hauptkomponenten-Analyse enthält zusätzliche Informationen, die ein tieferes Verständnis der Gruppen enthalten kann. Als letzter Schritt, Berechnung des Koeffizientes der Variation, ermöglicht es uns, den Grad der Standardisierung der einzelnen Variablen zu erkennen. Schließlich, sobald diese Daten bekannt sind, können die möglichen Maßeinheiten für das System der spanischen Oliven Tiegel erkannt werden.

RESUMEN

Estandarización y unidades de medida utilizadas en la producción de cerámica: el caso de la botijuela post-medieval u olive jar hecha en Sevilla

El objetivo de este trabajo es determinar el grado de estandarización de una producción cerámica y las unidades de medida que regulan su producción. El grupo elegido para probar esta metodología se conoce como *Spanish olive jar* o *botijuela*, fabricada en el sur de la Península Ibérica a lo largo del período moderno temprano. La metodología hace una caracterización morfométrica de cada vasija usando varias variables cuantitativas. Después se realiza la 'prueba de normalidad', y se calcula el coeficiente de 'correlación producto momento'; a éste sigue un análisis de grupos de las diversas botijuelas. El análisis de componentes principales identifica además diversos grupos de botijuelas, mientras el análisis de componentes principales ayuda a entender mejor dichos grupos. También se calcula el coeficiente de variación para identificar el grado de estandarización de cada variable. Finalmente, con todos estos datos se pueden identificar las posibles unidades de medida que regían el sistema de producción de estas botijuelas.

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