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Investigating the relationship between Phoenicians and wine through geometric morphometry

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Abstract

Grapevine (*Vitis vinifera*) is one of the most important fruit crops of the past and present world, both economically and culturally. The wild and domesticated forms, respectively *Vitis vinifera* subsp. *sylvestris* and *V. vinifera* subsp. *vinifera*, differ by an array of traits, including the form of their seeds that may be retrieved in archaeological assemblages. These are smaller, rounder and with a shorter stalk in the case of wild grapevine, and larger, more elongated and less sharply sculptured in the cultivated varieties [1]. Due to these differences, morphometry - the statistical analysis of form and its (co)variation - has played a key role since the beginning of the 20th century for the study of grape pips retrieved from archaeological contexts, in order to distinguish wild and domesticated seeds [1][2]. Such approach, initially based on linear measurements, recently refined with geometric morphometrics and chiefly outline analysis [3], now allows to perform morphotype prediction within the domesticated compartment, thus approaching cultivar-level distinctions. While comparison of archaeological material with modern varieties is less problematic for desiccated and waterlogged samples, recent studies have shown that this is possible also for charred samples [4].

Although grape domestication and viticulture are believed to have originated in Georgia, there appears to be a clear link between Phoenicians and the spread of viticulture in the Western Mediterranean [5].

The present study aims to contribute to the investigation of the role of Phoenicians in the spread and trade of grapevine through the morphometric analysis of grape pips. Waterlogged and charred samples were selected from three Western Mediterranean sites: Motya (Sicily, Italy), Nuraghe S'Urachi (Sardinia, Italy) and Huelva (Spain). While only Motya is a Phoenician foundation, all three were nevertheless undoubtedly associated with Phoenician expansion and cultural interaction.

Ten cultivars from the "Vivaio Federico Paulsen: Centro Regionale per la Conservazione della Biodiversità Agraria" in Marsala (western Sicily) were chosen as modern reference material (http://vivaiopaulsen.it).

PCA analyses allowed an inter-site comparison, showing that samples from the three sites are clearly distinguishable based on their morphology. This indicates the use of different varieties which may be due to different factors.

Statistical analyses of pip outlines show that archaeological material from these sites is morphologically comparable to that of modern varieties, suggesting that the archaeological finds may be described as "strongly domesticated". Nonetheless, no apparent correspondence to modern cultivars was found. This is partly related to the limited size of the reference collection, to the centuries of history that have had an impact on grape diversity, and to taphonomic factors.

This study comprises the first of many steps aimed at characterizing Phoenician grape pips.

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