



# Specialized pottery production in Dalma tradition; a statistical approach in pottery analysis from Soha Chay Tepe, Zanjan, Iran



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## ABSTRACT

Soha Chay Tepe is located on the right bank of the Sojasrud River and lies within the province of Zanjan, in Western Iran. During excavation, one cultural period and two architectural phases have been distinguished, contemporary to the Middle Chalcolithic period (Dalma tradition). More complex activities in Chalcolithic period are well studied and accepted by researchers, however analyzing pottery according to stylistic attributes revealed more details about systematic pottery production of this period in the west of Iran. A total of 96 pottery samples was chemically analyzed with portable XRF device in order to detect clustering pattern. Results have revealed meaningful similarities concerning composition between the sampled groups in regards to their decoration style. It showed that the potters of Soha Chay Tepe might have made distinct operation decisions for their various pottery style productions. Portable XRF with relative internal calibration used in this study confirmed that it has high potential in compositional studies of ceramic regarding to more detailed questions.

## 1. Introduction

Soha Chay Tepe is located in the Southwest of Zanjan City, east of Golabar village between the two small villages of Soha and Shiveh (Fig. 1A). It is located on the north bank of the Sojasrud valley, approximately 1712 m above sea level, at 36°19'06.25" longitude and 48°22'47.50" latitude (Fig. 1B). Soha Chay Tepe was excavated during summer and autumn of 2006, under the direction of Aali (2006). As the topographic plan shows (Fig. 1C), a total of eight trenches were opened in Soha Chay Tepe, which covered an area of approximately 100 m<sup>2</sup>, about a quarter of the site area. Apparently, a few short episodes of occupation are known at the site. The site consists of two architectural phases, with an earlier occupation in the southern part, from where the settlement later expanded north. The radiocarbon dating, performed on human and faunal bones, placed these osteological samples around 4269 cal BC to 3968 BCE, which confirmed Soha Chay Tepe was occupied during the Middle Chalcolithic period.

The Dalma tradition, like other traditions and periods in the Near East such as Halaf, exists as both a chronological and cultural phenomenon (Spataro and Fletcher, 2010). Moreover, like Halaf, Ubaid, Cheshmeh Ali and other traditions in the Near East, it is noteworthy for having a shared material culture tradition. The Dalma tradition spreads

over a large geographical area, ranging from the Urmia basin in Azerbaijan to the Seymareh basin in Lorestan in Western Iran (Fig. 2). (Spataro and Fletcher, 2010; Hole, 1987; Oates, 1983; Voigt and Dyson, 1992). The Early to Middle Chalcolithic assemblage in Northwestern Iran and the diagnostic Zagros highland Middle Chalcolithic pottery assemblage is called Dalma, after the type site of Dalma Tepe in the Southern Lake Urmia basin (Henrickson, 1989). Chronologically, the Dalma tradition continues in the Late Neolithic Hajifiruz and precedes in the Middle Chalcolithic Pisdeli in Northwestern Iran. In Central Zagros, the Dalma tradition follows the Early Chalcolithic and precedes in the Middle Chalcolithic II period.<sup>1</sup> The Dalma tradition dated from the fifth millennium BC to the early part of the fourth millennium BC, around the same time as the Ubaid III tradition became established in Western Mesopotamia and dating roughly to Sialk III, the tradition in the Central Plateau of Iran.

The Chalcolithic period encompasses some of the most remarkable and visually striking discoveries (Lee, 1973; Bar-Adon, 1980; Gilead, 1985, 1990; Levy, 1993, 1995; Joffe and Dessel, 1995; Joffe et al., 2001; Banning, 2002, 2007; Bourke, 2007; Kerner, 2010; Lovell and Rowan, 2011). The Chalcolithic, as the first period with metallurgy, large sprawling villages, rich mortuary offerings and cult centers, represents a developmental stage on the road to the urban Bronze Age,

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<sup>1</sup> In Kangavar valley the Dalma period follow Shahn Abad period (Early Chalcolithic) and precede Seh Gabi period (Middle Chalcolithic II). And in Mahidasht Plain the Dalma ceramics in Early Siahbid context follow JWare period (Early Chalcolithic) and precede late Siahbid (Middle Chalcolithic II).

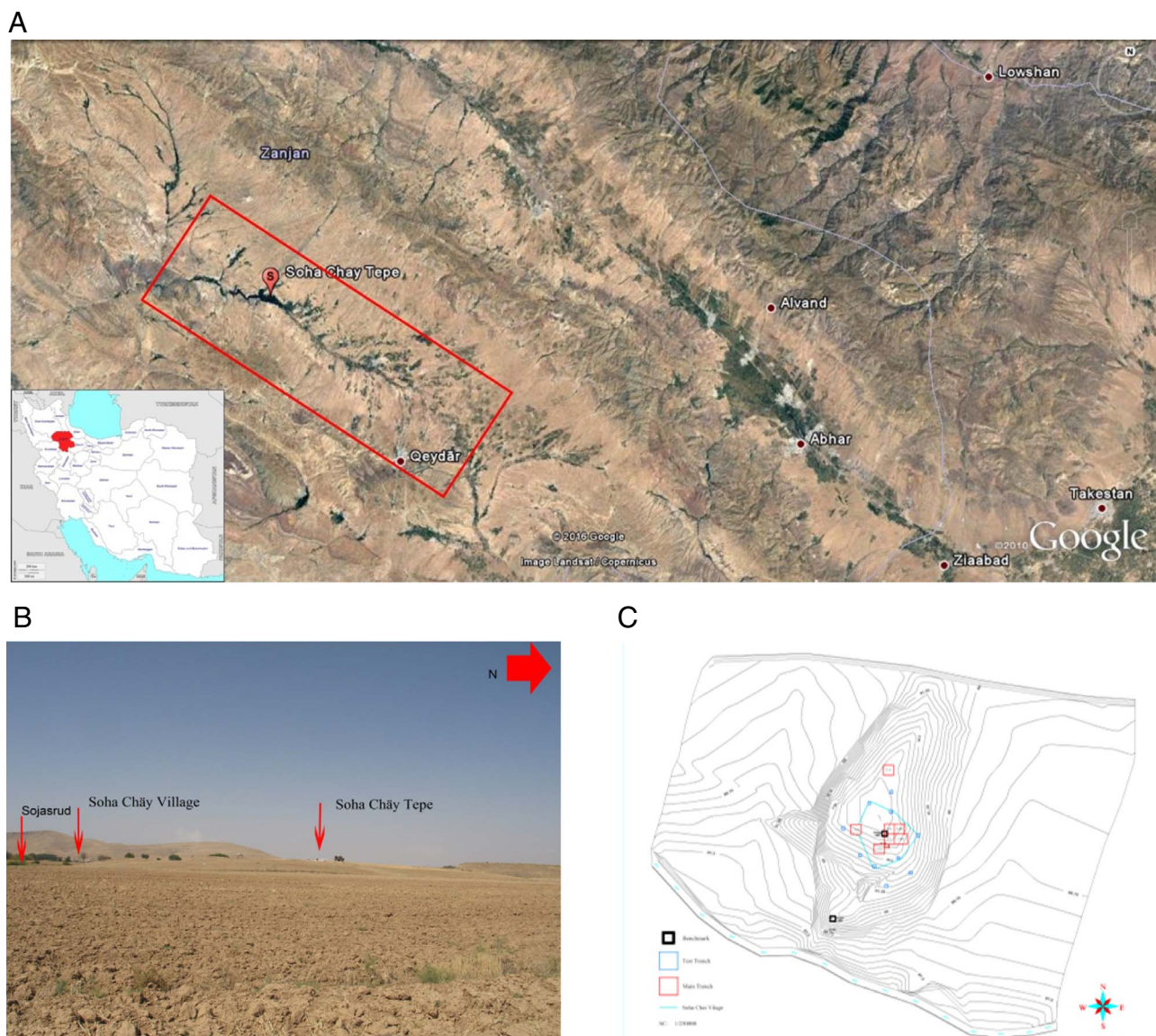


Fig. 1. A) location of site related to the Sojasrud valley and Zanzan province in Iran B) Soha Chay Tepe, C) Topographic map of Soha Chay Tepe.

the ‘dawn of history’ (Bar-Adon, 1980). A growing corpus of archaeological evidence suggesting the development of new technologies (metallurgy, high temperature potteries, ground stone and agricultural-technology) and the elaboration of social institutions (public temples and formal burial grounds, craft specialization, settlement site hierarchies) reflects the dynamic nature of society in the Chalcolithic time (Burton and Levy, 2001). More recent scholars have focused on the diverse economical actions, elaborated craft production and expanded networks for resource acquisition (Rowan and Golden, 2009; Lovell and Rowan, 2011). A key issue for understanding the importance of craft specialization in the Chalcolithic society is the identification of production activities (Levy, 1993). Specialized production can be proven through direct evidence such as production remains (workshops or work tools), but also, and more often, through indirect evidence in the form of standardization (Kerner, 2010). Indirect data such as standardization, labor investment, and skill have been suggested as criteria by archaeologists, for determining extension of control. These mentioned features are usually interpreted by means of pottery analysis in terms of their chemical or physical attributes (Costin, 2000).

Although, most authors traditionally use the term “Chalcolithic” for the Dalma tradition, we are going to present a precise definition of

characteristics and chronological boundaries for this period. In the first step, one of the main goals was to identify the characteristics of craft production in the Dalma period, on the basis of Soha Chay Tepe potteries, to answer the question: “Was there evidence for increasing standardization and specialization over the Dalma tradition as a Chalcolithic characteristic?” It is well accepted that pottery production is the result of a series of choices from selecting raw materials to its preparation, modification and, lastly, burning. It is assumed that following the same instructions to produce pottery always leads to pottery that is compositionally similar. Based on this assumption, the chemical compositions of Soha Chay Tepe potteries were analyzed in order to evaluate the amount of systematic homogeneity and similarities of characteristic typical pottery styles in this site. According to Arnold (2000), we know that the composition of pottery pastes does not tell us much about the organization of pottery production, because potters often changed their raw material sources and paste preparation techniques. However, standardization refers to homogeneity in pottery materials, pottery shape, and/or decoration (Costin and Hagstrum, 1995). To clarify this issue, we are going to explore whether an evident correlation can be observed in the selection and preparation of clays in regard to different pottery styles that appear in the Dalma tradition.

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