


NEW RADIOCARBON DATES FOR THE MIDDLE CHALCOLITHIC PERIOD OF THE CENTRAL ZAGROS, IRAN

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ABSTRACT. As one of the most extensive prehistoric entities of western Iran, Dalma culture belonging to the Zagros Chalcolithic, flourished in vast areas of the Central Zagros and Northwest Region of the country. This culture is defined essentially by its characteristic ceramic assemblages that show a marked uniformity in terms of technology, vessel forms, and painted designs throughout its territory. One of the main issues regarding this culture is its chronology, which was largely based on comparative studies, a few radiocarbon (^{14}C) dates analyzed in the 1960s–1970s, or a few confusing thermoluminescence dates. In this paper, a series of 15 charcoal samples from a recent salvage excavation at Nad Ali Beig, a single-period site dated to Dalma period, is presented that provide the first reliable absolute dates for a part of the Middle Chalcolithic period of the Central Zagros region. Based on these new dates we may suggest that Dalma culture flourished between ca. 5200/5100–4600 BCE. Furthermore, based on these dates it is now possible to determine the order of appearance of different types of the Dalma culture ceramic assemblage, including the Ubaid-related painted buff ceramics.

KEYWORDS: ^{14}C dating, central Zagros, Dalma culture, Middle Chalcolithic, Nad Ali Beig.

INTRODUCTION

During the fifth millennium BCE some of the prehistoric cultures of the Iranian Plateau, such as Bakun in Fars, Cheshmeh Ali in the Central Plateau, and Dalma in the Central and Northern Zagros range, grew up and occupied a vast area. Transformed and emerged from the earlier, usually localized Neolithic societies, each of these Chalcolithic cultures had a remarkable homogeneity in their distinct ceramic assemblages, indicating some sort of cultural coherence within their societies. During this period, Bakun culture, characterized by its fine buff painted ceramics, flourished in the Southern Zagros range; Cheshmeh Ali culture, with its characteristic black-on-red painted ceramics, dominated the entire Central Plateau and vast parts of northeast Iran; and Dalma Culture, with its distinct ceramic assemblages, occupied most of the Central and Northern Zagros in western Iran. Of these three prehistoric cultures, the temporal framework of the first two is, to a large extent, clear thanks to available radiocarbon (^{14}C) dates (e.g., Alizadeh 2006; Pollard et al. 2013), but that of Dalma Culture has been remained questionable because of the lack of reliable absolute dates.

Dalma Culture was first recognized through excavations conducted by the Hasanlu Project's team members in the late 1950s and early 1960s at the type site, Tappeh Dalma, on the southern coast of Lake Urmia in northwest Iran (Young 1963; Hamlin 1975). C. Hamlin, who several years later compiled a report on these excavations, classified the ceramic assemblage of the site into four groups: Dalma Impressed, Dalma Monochrome, Dalma Red Slip, and Dalma Plain Ware; the first two were the most typical ceramics of this period (Hamlin 1975). In the chronological chart established by the Hasanlu Project for the Lake Urmia Basin cultural region, Dalma Period (Hasanlu IX) succeeds the 6th millennium Neolithic of Haji Firuz (Hasanlu X) and precedes the Late Chalcolithic Pisdeli Period (Hasanlu VIII) (Voigt and Dyson 1992). Still, regarding the obvious difference between ceramics of these three periods, it is likely that some transitional phases are yet to be identified between them (see also Voigt and

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Dyson 1992:174).¹ After recognition of the Dalma ceramic assemblage at the type site, the same materials were identified at some sites on the southern and western Lake Urmia, such as Haji Firuz (Voigt 1983) and Tappeh Seavan (Solecki and Solecki 1973).

A major development in prehistoric archaeology of the Central Zagros in general and characterization of Dalma Culture in particular, was associated with the Royal Ontario Museum expedition in the Kangavar Valley in eastern part of the Central Zagros. This expedition, known as the Godin/Seh Gabi Project, led by T. C. Young and L. D. Levine, conducted a five-year excavation at these two key sites of the region from 1965–1973 (Young 1969; Young and Levine 1974). At Godin, ceramics identical to those of Tappeh Dalma were uncovered from the XYZ Trench (Spits 50–63) dug in the deep, eroded north face of the site. In Seh Gabi, a site consisting of six individual mounds, identical ceramics to those of the XYZ Trench were revealed in the lower levels of Mound B (Levels 7–5). These ceramic assemblages were recognized as Dalma by the excavators and were labeled Godin X period in the chronological chart established for the Kangavar Valley. It succeeds the poorly defined phase of Godin XI (Shahn Abad Phase) and precedes Godin IX (Seh Gabi Phase) (Henrickson 1983; Young and Levine 1974). While there is some continuity between ceramic assemblages of Dalma Period and the succeeding period of Seh Gabi, there is almost no recognizable ties between the ceramic assemblage of Dalma and that of the preceding phase (see Voigt and Dyson 1992:159).

The 1979 Iranian Revolution brought a long hiatus in prehistoric investigations of the Central Zagros region. Since the mid-1990s, however, an increasing number of fieldworks have been conducted in the region which contributes to our understanding of the cultural development of the region from the 10th to 5th millennium BCE. (see Matthews and Fazeli 2022). Some of these investigations, including excavations at the sites of Kani Mikaeil Cave (Roustaei et al. 2002), Lavin Tappeh (Hejebri Nobari et al. 2012), Qeshlagh (Motarjem 2014; Sharifi 2020), Baghi (Falahian and Nozhati 2016), Namshir (Saed Moucheshi et al. 2017), and Chapar Abad (Bahranipoor 2022, 2023), have provided a corpus of material culture of Dalma Period, but they failed to reveal useful information on architecture of this period due to the small exposures (Figure 1). Furthermore, neither of these excavations provided a reliable absolute date for the Dalma Period. Recent excavations at Tappeh Nad Ali Beig in the Central Zagros provided both some information on the architecture of Dalma Period and, more importantly, provided the first reliable ¹⁴C dates for this period.

The aim of this paper is to enhance our understanding of the Dalma period through presenting some new information on absolute dates, ceramic assemblages, and architecture of the Dalma period which have been obtained from two seasons of excavations at Nad Ali Beig, a typical Dalma site in the Central Zagros. We try to put new insights from the site in a wider geographical perspective, referring to the Dalma- and Dalma-related sites in northern Mesopotamia, northern Zagros, and Caucasia.

THE CENTRAL ZAGROS CHALCOLITHIC

The Central Zagros covers approximately the current areas of the provinces of Kermanshah and Ilam, and parts of Lorestan, Hamedan, and Kordestan in western Iran. Archaeologically this region has been divided into two main zones: Western Lorestan and High Road and

¹Our recent rescue excavation at the site of Chapar Abad, some 27 km west of Tappeh Dalma, has provided good ceramic evidence of this transition period (Bahranipoor 2023).

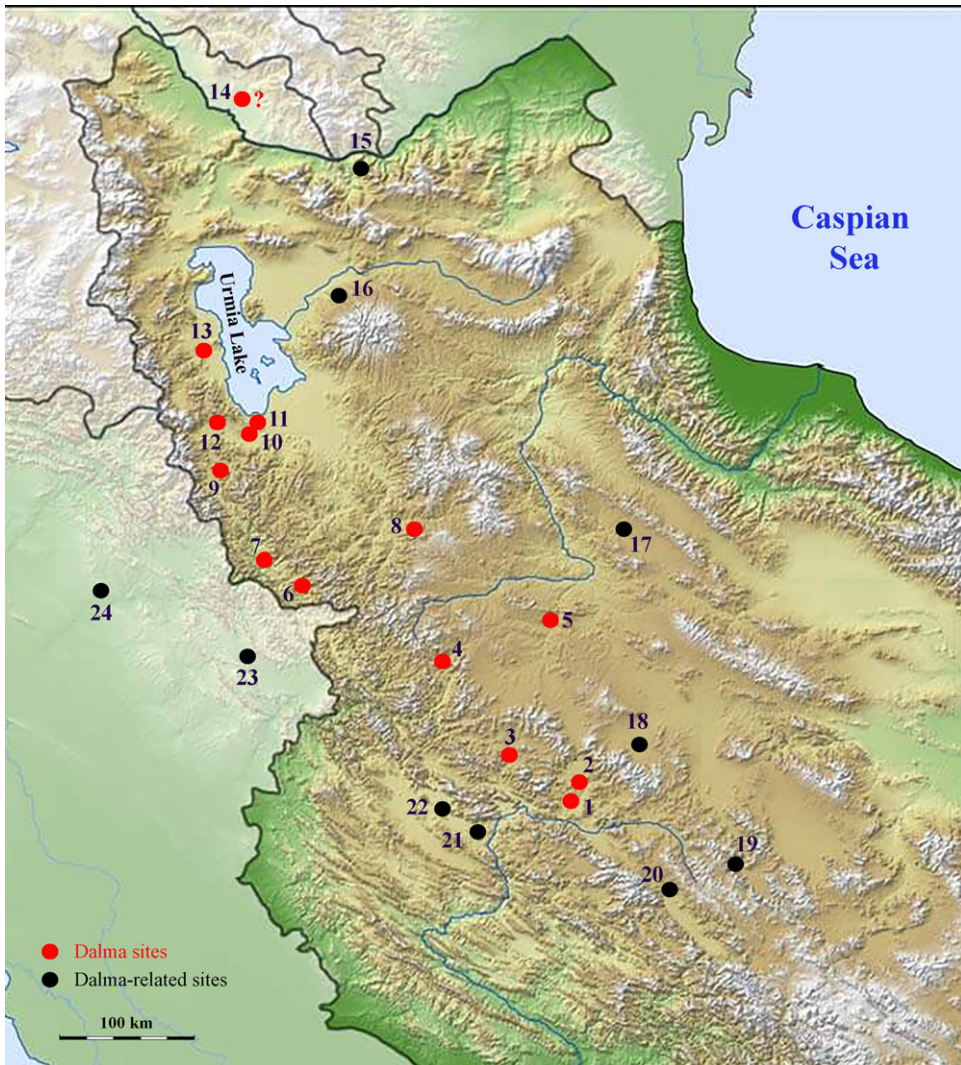


Figure 1 Location of the excavated sites of Dalma- and Dalma-related period in the Central Zagros and the Northwest Region: 1. Godin; 2. Seh Gabi; 3. Nad Ali Beig; 4. Gryashan; 5. Qeshlagh; 6. Namshir; 7. Tappeh Baghi; 8. Kani Mikaeil Cave; 9. Lavin; 10. Tappeh Dalma; 11. Pisdeli; 12. Chapar Abad; 13. Seavan; 14. Nakhchivan Tappeh; 15. Kul Tepe; 16. Yanik; 17. Soha Chai; 18. Taze Kand; 19. Sarsakhti; 20. Qela Gap; 21. Siahbud; 22. Chogha Maran; 23. Kani Shaie; 24. Surezha.

Eastern Lorestan. The High Road has been divided into two sequences of Mahidasht in the west and Kangavar in the east (Voigt and Dyson 1992; Gopnik and Rothman 2011). Most information on the Chalcolithic period of the Central Zagros comes from the Royal Ontario Museum excavations at two key sites of Godin and Seh Gabi in the Kangavar Valley. Although Young and Levine, the directors of Godin/Seh Gabi Project, outlined the prehistoric cultural sequence of the region from the late Neolithic to the Iron Age (Levine and Young 1987), it was Elizabeth Henrickson who established a well-articulated sequence of the Chalcolithic Period of the Central Zagros based on detailed ceramic analyses (e.g., Henrickson 1983, 1985, 1986; Henrickson and Vitali 1987). During her studies on the Zagros Chalcolithic,

Henrickson used different methods for subdivision of the period and proposed different time-ranges for each phase, but in her latest publication (1992) she divided the Chalcolithic period of the region into three phases: Early Chalcolithic, Middle Chalcolithic, and Late Chalcolithic. Middle Chalcolithic was further subdivided, from early to late, into three subphases I, II, and III; subphase I represents the Dalma period.

During the Chalcolithic period, the two areas of the Central Zagros, i.e., Mahidasht in the west and Kangavar Valley in the east, had mostly their own cultural developments and interaction spheres. In general, the Mahidasht area, due to its proximity to the Mesopotamia, had strong cultural ties with the lowland to the west, while the Kangavar Valley formed its own cultural character with increasing interaction with the Central Plateau to the east and the Northwest Region to the north. For instance, while the Early Chalcolithic in the Mahidasht area is characterized by a distinct and widespread ceramic, called J-Ware, bearing close similarities with the Late Halaf ceramic assemblages of northern Mesopotamia, the eastern part of the Central Zagros (Kangavar Valley) is poorly characterized by a monotone, highly localized ceramic tradition known as Shahn Abad, which was first documented in excavation at Mound C of Seh Gabi (Young and Levine 1974; Levine and Young 1987). During the Middle Chalcolithic phase, the relative separation between the material cultures of the two areas of the Central Zagros continues, but its earliest phase, represented by the Dalma Period, occupies a surprisingly vast area stretching from the northern Lorestan to the Lake Urmia Basin in northwest Iran. In the Late Chalcolithic phase, Kangavar Valley shows increasing interaction with the Central Plateau in the east, as evidenced by close ceramic similarities between the two regions during Godin VII and VI periods (Roustaei and Azadi 2017).

Our information about the social structure of the Middle Chalcolithic societies of the Central Zagros is scanty. The known Dalma sites of the Central Zagros and the Northwest Region show no hierarchy in terms of settlement size; they all represent small hamlets and villages between 1–2 ha in area. Except for a handful of simple seals recovered from the Middle Chalcolithic contexts (Henrickson 1988; Henrickson and Vitali 1987), no artifact suggestive of social complexity is reported from Dalma sites. Despite this apparent lack of social complexity, these societies should not be viewed as isolated from their neighboring regions, but they were part of a web for transferring materials, ideas, and people. The existence of some exotic materials, such as lapis lazuli, turquoise, obsidian, and copper, at contemporaneous sites both in the Central Zagros (such as Nad Ali Beig) and adjacent areas (such as Tepe Gawra in northern Mesopotamia, and Chogha Mish in lowland Susiana) indicate that there was some degree of communication between these societies during the fifth millennium BCE (cf. Tobler 1950:176–200; Alizadeh 2008:20).

Dalma and Dalma-Related Ceramic Assemblages

Since defining Dalma as a distinct ceramic tradition in the 1960s and 1970s in the northern and central Zagros regions, many sites in surrounding areas, such as the western piedmonts of the Zagros in northern Mesopotamia, have been identified as having Dalma materials. This caused some confusion about this cultural entity and its cultural sphere. In such situations, it is important to differentiate the genuine cultural materials of a given culture from its “related” ones. Regarding Dalma culture, we should look into its ceramic assemblages at key sites in its heartland, which is the Zagros highlands (see Henrickson 1983). These key sites are Tappeh Dalma in the southern Lake Urmia and Godin and Seh Gabi (Mound B) in the Kangavar valley in the eastern Central Zagros.

As mentioned before, the site Tappeh Dalma produced four ceramic types according to Hamlin (1975): Dalma Impressed (surface-manipulated), Dalma Monochrome, Dalma Red Slip, and Dalma Plain Ware. In the Central Zagros sites, however, the Dalma contexts revealed eight ceramic types: the four types already known from Tappeh Dalma plus four other ceramic types: Dalma Bichrome, Dalma Streaky, Black-on-Buff (BOB), and Dalma Ubaid/Untempered (DUP). The latter four types have a limited distribution and are mainly documented, with low frequencies, at a few sites only in the Central Zagros. So far, Dalma Bichrome, which thought to be a variant of Dalma Monochrome (Henrickson and Vitali 1987:38), is found in excavations at only two sites, Seh Gabi (Level 7) and Nad Ali Beig; in the latter it comprises just 0.1% of the whole assemblage.² It is possible that Dalma Bichrome imitated the polychrome painted J Ware in the Mahidasht to the west which has related to the Late Halaf ceramic of northern Mesopotamia (Renette 2022). Dalma Streaky has also a limited geographical distribution and low frequencies and is mostly confined to a few sites, including Seh Gabi, in the Central Zagros. This ceramic type is present throughout the Nad Ali Beig sequence but in very low frequency (less than 0.3% of the whole assemblage). Henrickson (1983:600) has suggested that Dalma Streaky is a local development inspired from J Ware in the Mahidasht.

While Dalma Streaky and Dalma Bichrome seem to be local development, both BOB and DUP can be considered as the consequence of increasing westward interaction with the lowland Mesopotamia through Mahidasht. As Henrickson and Vitali (1987:39) have pointed out, stylistically and technically, both BOB and DUP are not part of the highland classic Dalma assemblage; rather, they bear a generic resemblance to the lowland Mesopotamian Ubaid ceramic tradition. They are relatively thin, highly fired unslipped ceramics with fine mineral and chaff temper. The Mesopotamian origin of these wares is supported by their much more frequencies in ceramic assemblages of the western part of Central Zagros (Mahidasht) which is in fact the gate to the Iranian Plateau from the lowland Mesopotamia along a natural communication corridor known as the High Road or the Great Khorasan Road (e.g., Henrickson 1983; Gopnik and Rothman 2011; Renette et al. 2021a). Diffusion of Ubaid-related buff wares along the High Road into the Central Zagros can be seen as part of a northward expansion of the black on buff ceramic tradition from southern Mesopotamia into the Zagros highlands. This type of ware was introduced into the Deh Luran Plain in southwest Iran in the second half of the 6th millennium BC, where is represented by Chogha Mami Transitional phase, related to the Samarra culture (Hole 1977), in the Central Zagros around late sixth millennium BC, and in the Northwest Region in mid-fifth millennium onwards (Voigt and Dyson 1992:175). These lowland-related buff ceramics should not be seen as an integrated components of the classic Dalma ceramic assemblages, because they appear on a few Dalma sites, mostly along the High Road in the Central Zagros, such as Godin, Seh Gabi, and Nad Ali Beig.

Considering the foregoing discussion, it is obvious that these four ceramic types are not necessary components of every Dalma assemblage. Rather, the essential components of a given ceramic assemblage to be labeled Dalma are Dalma Red Slip, Dalma Plain, Dalma Monochrome, and Dalma Surface-Manipulated (Impressed). Of these, Dalma Monochrome

²During a reconnaissance survey of Songhor Plain, north of Kermanshah, a Dalma Bichrome sherd was found at the surface of Tappeh Khodaei (Khatib Shahidi et al. 2012:34, Figure 3.15). Moreover, five bichrome painted sherds were found from Bayat Phase (ca. 4600–4400 BCE) in Tappeh Sabz, in the Deh Luran Plain, where interpreted as being indicative of influence from the Amuq Plain to the west (Hole et al. 1969:169, Figure 68.a, b). The relationship between the Bayat Phase specimens and those of Dalma culture needs further evidence.

stands as the most basic one, because of its distinct physical characteristics, and because, contrary to Dalma Red Slip, Dalma Plain, and Dalma Impressed, is confined strictly to the likely time-range for the Dalma period, ca. 5200/5100–4600 BCE (see below; see also, Renette et al. 2021a:36). Dalma Impressed, though characteristic, has a much wider temporal and spatial range than that of Dalma Monochrome and continues into the later periods and surrounding area, although with some modifications. Because of its vast distribution, Dalma Impressed, or its related variants, have caused some confusion on ascribing some sites to the Dalma period. For example, finding of a few Dalma-related Impressed ceramics in otherwise different assemblages of Tazeh Kand in the northern Hamedan Plain (Balmaki 2017) and Qala Gap in the northeastern Lorestan Province (Abdolahi et al. 2014) has prompted the excavators to ascribe these sites to Dalma period (Figure 1). Therefore, the existence of Dalma Impressed alone in a ceramic assemblage does not necessarily indicate that the assemblage belongs to the Dalma period (cf. Renette 2022). In other word, a given ceramic assemblage could be considered as Dalma, providing Dalma Impressed coexists with Dalma Monochrome as the characteristic components, along with Dalma Red Slip and Dalma Plain which usually comprise the bulk of a Dalma ceramic assemblage. As we will see below, this condition does not work for Dalma Monochrome, because its appearance in Dalma contexts slightly precedes that of Dalma Impressed; so, it is possible that at some sites it occurs not associated with Dalma Impressed, though such cases are not yet documented.

Dalma Red-Slipped ware has an even longer duration than that of Dalma Impressed in archaeological contexts of the Central Zagros. It starts in the late 7th millennium BCE contexts of the Neolithic, such as Guran (e.g., Mortensen 2014) to at least the mid-fourth millennium contexts of the Late Chalcolithic (Voigt and Dyson 1992; Henrickson 1983:171; see also Renette 2022:133).

The second factor for identifying a certain ceramic assemblage as Dalma is the frequency of occurrences of the foregoing classic Dalma ceramic types in it. Recently, Renette rightfully pointed out that a Dalma archaeological assemblage should consist of at least 90% classic Dalma pottery and other aspects of Dalma material culture (Renette 2022:144). Considering these two factors, several sites outside the “core area” of the Dalma culture that have been ascribed to this period should be overruled. Such sites are, in fact, Dalma-related, which usually contain a small amount of Dalma Impressed ware in their otherwise different ceramic assemblages. Following these requirements, none of the Mahidasht sites, such as Siahbid and Chogha Maran, with Red-Slipped and Dalma Impressed components belong to the Dalma period, because, first, they are lacking the characteristic Dalma Monochrome (Henrickson 1983; Renette et al. 2021a, 2022), and second, the quantities of these two Dalma ceramics in their ceramic assemblages are small, highly outnumbered by local ceramic types (e.g., Renette et al. 2022:29, Figure 3). This is the case also for several sites in the east of the Tigris which either contain only small amount of Dalma Impressed, such as Kani Shaei, Phase VII and VIb (Renette et al. 2021a), or contain a small amount of both Dalma Impressed and Dalma Monochrome, such as Surezha (Stein 2018:43; Stein and Fisher 2020:142).

With these considerations in mind, we would be able to define to some extent the cultural zone occupied by Dalma culture, as represented by sites with full assemblages of characteristic Dalma ceramics. It seems likely that Dalma culture did not extend in the western piedmonts of Zagros; neither of sites in the Hamrin and “Trans-Tigridian areas” provided full and prevailed assemblages of Dalma ceramics (Renette 2022). To the south, the full Dalma ceramic assemblages are present in the Kangavar Valley; further south, in Lorestan, no certain Dalma



Figure 2 (a) Drone photo of Nad Ali Beig and its immediate landscape; (b) location of the excavated trench in the first season.

assemblage, except sporadic Dalma Impressed-related and Red Slip sherds, is reported (Goff 1971). To the east, the hilly terrains to the east of Kangavar Valley, Hamedan, and Zanjan produced no full ceramic assemblages of this period (e.g., Swiny 1975), but few Dalma Impressed- or Monochrome-related sherds in otherwise different ceramic assemblages, such as Qela Gap (Abdolahi et al. 2014), Taze Kand (Balmaki 2017), Sarsakhti (Abedi et al. 2014a), and Soha Chai (Rahimi Sorkhani and Eslami 2018). To the north, the situation of Dalma settlements is not clear enough. The northernmost known site with actual Dalma ceramics is Tappeh Seavan (Solecki and Solecki 1973). From this site to the border with the Republic of Azerbaijan, no certain Dalma sites are reported. Nevertheless, both Dalma Impressed and Dalma Monochrome are recently recovered from Nakhchivan Tepe in the Republic of Azerbaijan (Bakhshaliyev 2018, 2020), along with local ceramics. As there is almost no

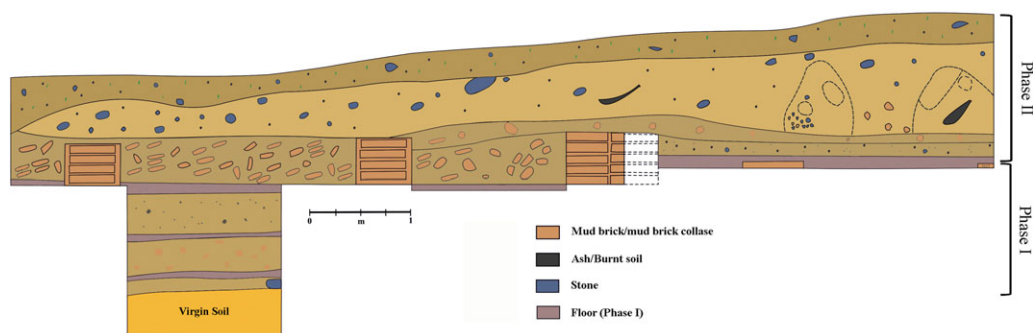


Figure 3 Trench 3, profile of the south wall.

information on the probable Dalma presence in the western Lake Urmia (from Tappeh Seavan in the south to the border with Nakhchivan region in the north), and as the detailed excavation report of Nakhchivan Tepe is not yet published, it is difficult to interpret the material from Nakhchivan Tepe in a wider cultural sphere of Dalma, though the excavator claims that Dalma culture has been originated from Caucasia then spread southward (Bakhshaliyev 2018), a claim that needs further evidence to be verified. It seems that the situation of Dalma culture in the eastern Lake Urmia is similar to the periphery areas of the Dalma heartland, such as the western piedmonts of the Zagros, where usually scattered Dalma Impressed or a handful of Dalma Monochrome sherds are found in otherwise different ceramic assemblages, such as Yanik Tappeh (e.g., Burney 1964:58, Pl. XV.3).

Chronology of the Dalma Period

One of the main issues of Dalma culture has been its chronology. Until our excavations at Nad Ali Beig, our information on the absolute chronology of Dalma period relied primarily on a handful of ^{14}C and Thermoluminescence dates both from the 1960s–1970s excavations and the fieldworks carried out from the 2000s onward. Those from earlier excavations were obtained from Tappeh Dalma (1 date) in the Lake Urmia Basin (Hamlin 1975, Table 2), Mound B at Seh Gabi (1 date) in the Kangavar Valley (Henrickson 1983, Table 71), and Dalma-related deposits of Siahbid (2 dates) in the Mahidasht Plain (Marshall 2012:258–259). In an attempt to reevaluate and assess the ^{14}C dates from the prehistoric contexts of Iran, J. Marshall (2012) concluded that neither of these dates can be considered with confidence because of the lack of necessities involved in extraction and scientific procedure on ^{14}C samples (Table 1). Obviously, one of the main problems with these dates is that they show a wide time-range (between 400–500 years), making them unreliable. The sample from Seh Gabi Mound B (Level 6) produced a ^{14}C date of 4565–4410 BC (18) (Voigt and Dyson 1992, Table 2), which, as we will discuss below, is out of the likely time-range of the Dalma period. As for the sample from Tappeh Dalma and Siahbid, these dates might also be problematic, because they were taken before the 1980s and the material is unknown.

These confusing dates made researchers suggest different time ranges for the Dalma Period. For example, Hamlin suggested a time-range between 5000–4000 BCE for this period based on relative stratigraphy of Hasanlu and the available ^{14}C dates for Haji Firuz and Pisdeli period at that time which bracket Dalma deposits (Hamlin 1975:120). As we now know, though this wide time-range covers most of the Dalma period, its later half (i.e., 4500–4000 BCE) is irrelevant. In

Table 1 Radiocarbon dates from Tappeh Dalma and Siahbid (Marshall 2012:246–247, 258–259).

Site	Lab code	Sample type	¹⁴ C age (BP)	Cal. date (BC), 2σ	Hygiene	Reason
Dalma	P-503	Ashy soil	5986 ± 87	5207–4687	Unreliable	Only 1 date
Siahbid	P-442	Charcoal and large amount of clay	5828 ± 80	4896–4493	Unreliable	Bulk sample
Siahbid	QU-1035	n.d.	5870 ± 120	5038–4458	Unreliable	Material unknown

Table 2 Frequencies of different types of Dalma ceramics in the ceramic assemblage of Phase I and Phase II of Trench 3.

Ceramic type	Phase I		Phase II	
	#	%	#	%
Red Slip	1022	67.4	2588	53
Plain	199	13.1	980	20
BOB/DUP	186	12.3	469	9.4
Monochrome	100	6.6	542	11
Streaky	8	0.5	17	0.3
Impressed	0	0	300	6.1
Bichrome	0	0	10	0.2
Totals	1515		4906	

a review of the prehistoric cultures of western Iran, F. Hole suggested a reasonable time-range for Dalma period in Azerbaijan based on relative chronology, ca. 5200–4700 BCE, while he put Dalma period roughly in 4500 BCE in the Kangavar sequence (Hole 1987, Table 2). E. Henrickson, who carried out one of the most intensive studies on the Dalma period, suggested different time ranges for the period on different occasions. She suggested, in 1985, that the period spans the range 4100–3700 BC (Henrickson 1985:50), but several years later she changed it to 5100–4000 BC (Henrickson 1989:369). Finally, she suggested the range 5000–4800 BC for the period based on comparative studies (Henrickson 1992:287). Although the latter has a limited duration, it properly fit in the chronological framework of the Dalma period based on our ¹⁴C dates (see below).

While most researchers proposed a time-range for the Dalma period that essentially covers the fifth millennium, Tonoike on several occasions mentioned a sixth millennium BCE date for this period (e.g., Tonoike 2009:26, Figure 18; 2012:65). Although it is likely that Dalma culture began in the last centuries of the sixth millennium BCE (see below; also, Renette 2022), it essentially covers the first half of the fifth millennium BCE.

During the last two decades some Chalcolithic sites have been excavated both in the Central Zagros and northwest region. Of these, three sites are relevant to our discussion: Tappeh Qeshlagh near Bijar, Soha Chai near Zanjan, and Kul Tappeh near the border between Iran



Figure 4 Drone photo of the architecture of Phase I of Trench III and the corresponding plan.

and Republic of Azerbaijan. Tappeh Qeshlagh is a typical Dalma settlement which produced all four common Dalma ceramic types, occurring at the type-site, Tappeh Dalma. Two thermoluminescence dates are available for Dalma contexts of the site: 5500 ± 250 BC and 5000 ± 350 BC (Sharifi and Motarjem 2018, Figure 4). The dates are problematic because the field requirements needed for this type of dating have not been applied. More importantly, they are not calibrated, thus showing a wide time range as much as 600 years which makes them unreliable.

The two sites of Soha Chai and Kul Tappeh have been claimed to contain Dalma levels. The putative Dalma deposits of Soha Chai have been ^{14}C dated to 4269–3968 BC (Rahimi Sorkhani and Eslami 2018:220). The point is that, based on the published materials (Rahimi Sorkhani et al. 2016; Rahimi Sorkhani and Eslami 2018; Aali 2007), no typical Dalma ceramic, such as Dalma Impressed or Dalma Monochrome, is seen in the ceramic assemblage. Based on the author's examination of both published and unpublished materials of the site, the Soha Chai ceramic assemblage has an eclectic nature, showing similarities with Godin VII materials of the Central Zagros on one hand, and with Qabrestan I in the Central Plateau on the other hand. It is also worth noting that the single absolute date of Soha Chai is far younger than the proposed dates for Dalma period which put it essentially in the first half of the fifth millennium BC

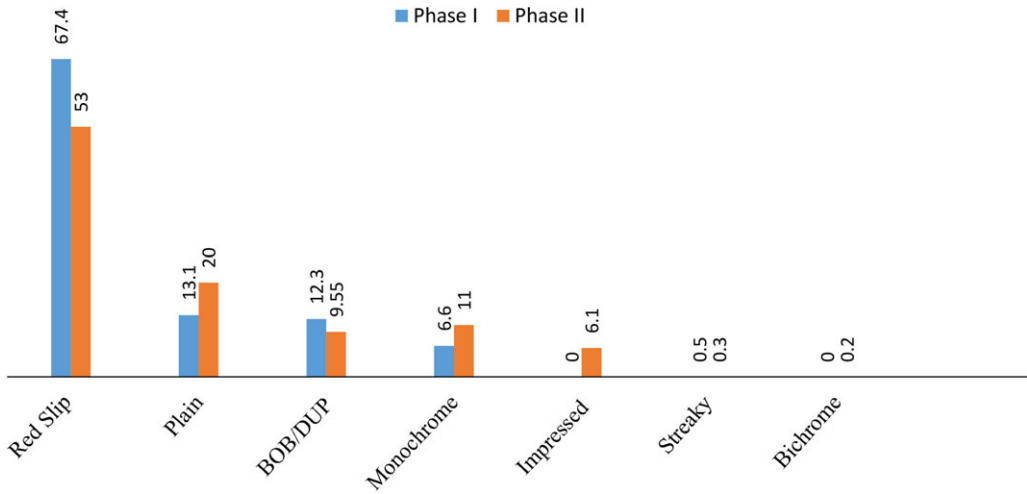


Figure 5 Frequencies of different types of Dalma ceramics in the ceramic assemblage of Trench 3.

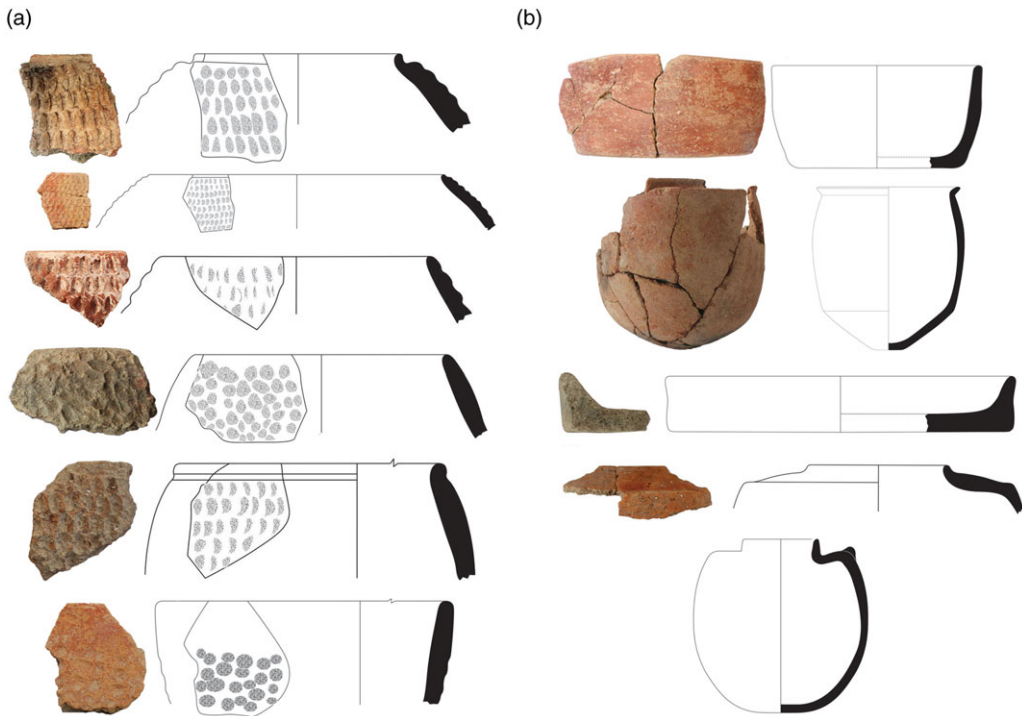


Figure 6 (a) Dalma Impressed; (b) Dalma Red Slip.

(cf. Zamani Dadaneh et al. 2021:22, footnote 6). Therefore, in our opinion, based on ceramic similarities, Soha Chai might be dated to the Godin VII/Qabrestan I period. In fact, new ¹⁴C dates from Tappeh Qabrestan (ca. 4200–3900 BCE) conforms very well with those from Soha Chai (Pollard et al. 2012, Table 17).

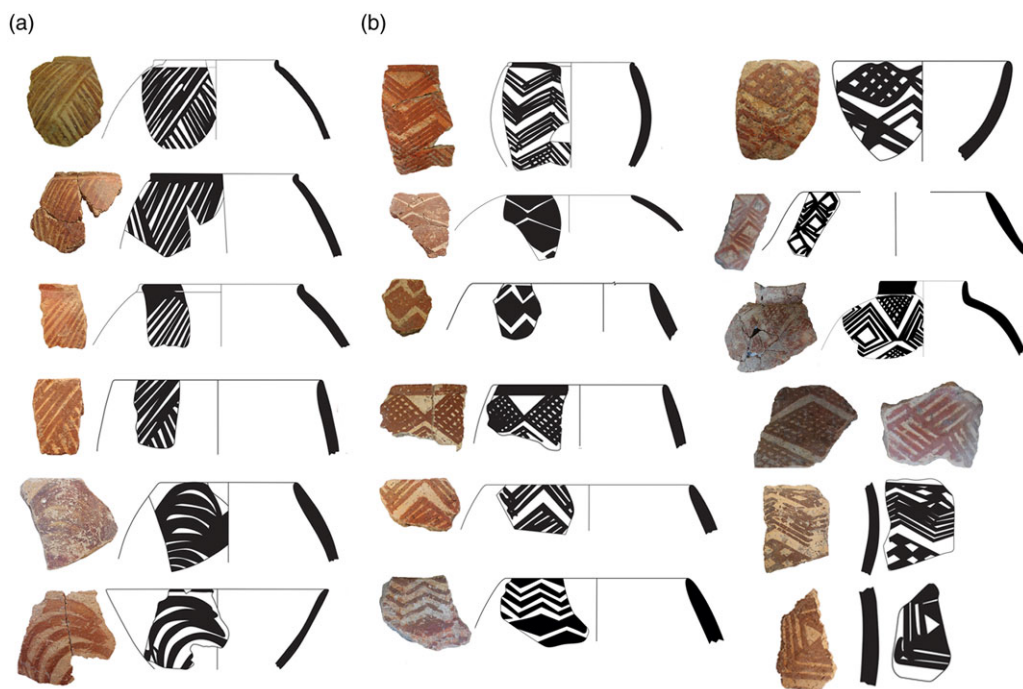


Figure 7 Dalma Monochrome. (a) Early Phase, (b) Late Phase.

Kul Tappeh is a 19-m-high, multi-period mounded site located at the northernmost tip of the Northwest Region. The site contains a long sequence of settlements spanning mid-fifth millennium BC to the Achaemenid period (ca. 550–330 BC). The sequence has been divided into eight major periods, from I to VIII, top to bottom. The excavator has claimed that the earliest period, VIII, ¹⁴C dated to around mid-fifth millennium BC, represents the Dalma period (Abedi et al. 2014b, Figure 61; Abedi 2016, Table 2). Like Soha Chai, however, no typical Dalma ceramic, such as Dalma Impressed or Dalma Monochrome, occur in the Kul Tappeh ceramic assemblage (cf. Abedi et al. 2015, Figure 5 with Hamlin 1975, Figures 4–7; see also, Zamani Dadaneh et al. 2021:2, footnote 6; Renette 2022). There are no plausible similarities between the forms and painted motifs of Kul Tappeh ceramics to those of typical Dalma ceramic assemblages (cf. Hamlin 1975; Levine and Young 1987, Figures 4–6).

To sum up this discussion, no *reliable* absolute dates have been available so far for typical Dalma contexts in the Central Zagros and Northwest Region. The available dates, discussed above, are either problematic or simply irrelevant to the Dalma period. However, those researchers who conducted in-depth studies on the prehistory of the Zagros Mountain (e.g., Henrickson 1992; Hole 1987; Rothman and Badler 2011, Table 4.1; Renette 2022) concur that the Dalma period falls within the first half of the fifth millennium BC, a notion that is firmly approved by new ¹⁴C dates from Nad Ali Beig.

EXCAVATIONS AT NAD ALI BEIG

Nad Ali Beig (N 3845934 E 724965) is a single-period, badly damaged, small mound site situated at 1612 m above sea level in the Songhor Plain in the Central Zagros region (Figures 1, 2b). The site,

ca. 2 ha in area, was excavated over two seasons in 2016 and 2017 by opening five trenches of various sizes (Bahranipoor 2018). In the first season, four trenches were opened: two trenches (Tr. 1 and Tr. 2) in the northern and eastern part of the site to gain an impression on architectural remains of the settlement, and two step trenches (Tr. A and Tr. B) for stratigraphic purposes (Figure 2b). Tr. 1, 5 × 5 m, was excavated to a depth of 120 cm below the ground surface and from this depth it was dug to virgin soil at 222 cm in a small 2 × 2 m sounding (Figure 2b). The excavated sequence consisted of an upper 60-cm-thick pile of cobble collected by modern local farmers underlying a series of loose deposits rich in ash, charcoal, animal bones, potshards, indicating daily refuse. No trace of architecture was found in this trench. Tr. 2, 5 × 5 m, was excavated to a depth of 140 cm below the ground surface and proved to be highly disturbed by two modern burials (Figure 2b). Excavation at this trench was halted without reaching virgin soil. Excavation at Tr. A, 2 × 3 m, was stopped at a depth of 80 cm due to the damage occurred by an illegal digging overnight. Tr. B, 3 × 5 m, was excavated to a depth of 260 cm below the ground surface in two steps and then was dug in a small 1 × 1 sounding to depth 395 cm, where virgin soil was reached (Figure 2b). The upper one meter was disturbed due to modern agricultural activities and a recent burial, but in lower levels we could identify remains of a partial mud brick architecture and beaten earth floor.

Most information regarding the architecture, stratigraphy and ceramic sequence of the site was obtained from Trench 3 (10 × 8 m) excavated in the second season (Figure 2a). Excavation at this trench went down to a depth of 170 cm below the ground surface, where it was continued to the virgin soil at 275 cm in a small, 1.5 × 1.5 m sounding (Figure 3). Based on both architectural remains and ceramic developments, the excavated sequence of Trench 3 can be divided into two phases. Phase I from the virgin soil to a depth of 135 cm below the mound's surface, and Phase II from that depth to the surface. Each of these phases is characterized by architectural remains and associated deposits.

Phase I

This phase contains the occupational deposits from virgin soil to a depth of 135 cm below the mound's surface. While the lower half of this phase was excavated in a small sondage, the upper part provided a well-articulated architectural remain consisting of several spaces (Figure 3). These remains were much better preserved than those of the upper Phase II.

Architecture

Phase I provided a well-preserved mud brick architecture, including living rooms associated with storage bins and open areas (Figure 4). The architectural features were constructed using two sizes of mud bricks; 40 × 38 × 10 cm, and 60 × 35 × 10 cm. Both mud bricks seem to be made by use of a mold. The mortar used between mud bricks was a mixture of mud and chaff, about 2 cm thick. The walls are constructed simply on the preexisting ground with no foundation. As a rule, the walls of indoor spaces were coated by light gray clay plaster; in a few instances, the plaster was renewed several times. The focal architectural space of Phase I is a modest rectangular space (A) which is divided into two parts by a T-shaped wall and connected to a small square room (B) to the south through a doorway (Figure 4). Space C appears to be a food storage area as evidenced by three pithoi broken *in situ*, one of them contained several chipped-stones made of obsidian. This space was divided into two smaller spaces (C1 and C2) by a short mud brick wall. The floor of Space C2 against its western wall was partly paved by large potsherds (Figure 4, upper). Seemingly, a large part of Space G was deliberately leveled and paved by small river gravels and sand, greenish in color. More than 30 pieces of chipped-

stones and associated debris was found on this floor, which may point to its function as a stone tool workshop. Space I in the northwestern corner of the trench was probably a room for preparing food. This space was divided into two smaller spaces by a short mud brick wall. A semicircular oven was built on a low mud brick platform against the western wall of this space. A groundstone and a handstone were found in Space I2. Perhaps some of the indoor spaces were covered with matting as evidenced by faint white traces of decayed material, resembling matting, on the floor of Space B.

Ceramics

More than 20000 shards were collected during two seasons of excavations at Nad Ali Beig, but here we only deal with the ceramic collection from Trench 3, because it provided the longest sequence and best-preserved architectures among the excavated trenches, and also because all ¹⁴C dates are from this trench. Altogether, 6421 sherds were recovered from Trench 3; 1515 pieces from Phase I and 4906 pieces from Phase II (Table 2). All eight Dalma ceramic types that were documented in the Kangavar Valley at Godin (the XYZ Trench) and Seh Gabi, Mound B (Levels 7–5) were recovered from Nad Ali Beig.

The ceramic collection of Phase I includes six ceramic types: Dalma Red Slip, Dalma Plain, Dalma Monochrome, Dalma Streaky, Black-on-Buff (BOB), and Dalma Untempered Painted (DUP) (Table 2, Figure 5). The most frequent ceramic type of Phase I is Dalma Red Slip which constitutes more than three-quarters of the ceramic collection of Phase I (67.5%; # 1022) (Figure 5). This ware, and its variant, Dalma Plain ware which comprises 13.1% (# 199) of the ceramic collection of Phase I, are heavily chaff-tempered, usually poorly fired and has a rather coarse fabric. The Red Slip ware, as its name implies, bears a rather thick clay slip ranging in color from light orange to deep red and purple (Figure 6b). There is a variant of Red Slip Ware which has a double slip. In such cases, a deep red or purple clay slip has been applied on a cream or buff slip. The common vessel forms of both Red Slip and Dalma Plain include hemispherical bowls, large and small jars, shallow trays or basins, large shouldered jars, footed vessels, and short-necked jars and pots (Figure 6b). Dalma Plain ware has often a buff fabric, usually without a recognizable slip or any other surface treatment. Its surface is usually smoothed, but in many cases the coarse chaff tempers are visible on it.

Dalma Monochrome has a heavily chaff-tempered fabric which ranges in color from light buff, light brown, to light red. Dalma Monochrome, as the most typical ware of Dalma Period, comprises 6.6% (# 100) of the ceramic collection of Phase I (Table 2, Figure 5). This ceramic usually bears a thick clay slip, mostly light buff in color, but also light brown and sometimes dark red to purplish, on the outer surface and a light buff or cream slip on the inner surface, yet some specimens show no recognizable slip. The painted decoration of Dalma Monochrome in this phase are exclusively linear, including parallel, oblique, or concentric curvilinear bands in brown, black and red; it seems that the latter design is a local development, because it is not reported from other Dalma sites (Figure 7a). Sometimes the painted bands are so closely arranged that it may be mistaken with Dalma Streaky. The most common vessel forms of Dalma Monochrome include globular pots, shallow open-mouth bowls, and hemispherical bowls.

Dalma Streaky has the least frequency among the ceramic types of Phase I (about 0.5%; # 8; Table 2, Figure 5). In many respects, this ware is very similar to Dalma Monochrome, except it is harder, better-fired, and denser (see also, Henrickson and Vitali 1987:38). The fabric color ranges

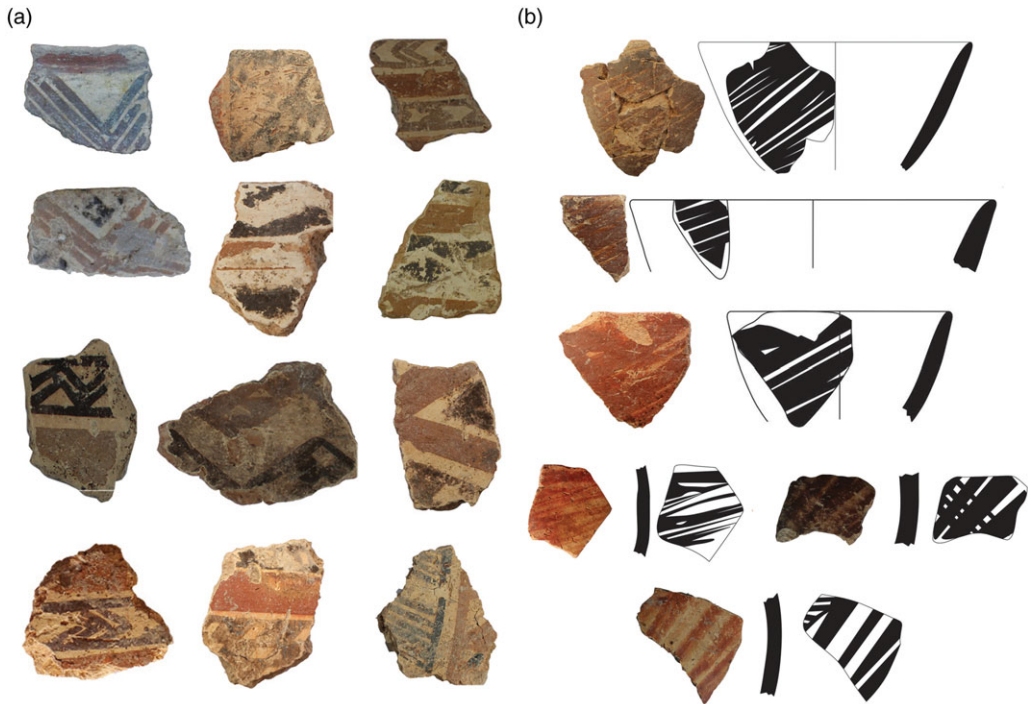


Figure 8 (a) Dalma Bichrome; (b) Dalma Streaky.

from light buff to light red. This ceramic usually bears a buff or cream slip, on which the dense painted bands, usually in red or dark brown, are applied. The common vessel forms of this ceramic are open-mouth bowls with everted body and open-mouth, deep bowls (Figure 8b).

Two fine wares of BOB and DUP together constitute 12.3% (# 186) of the ceramic collection of Phase I (Table 2, Figure 5). In almost every attribute, they differ from the rest of the Dalma ceramic assemblages (Figure 9). Both are thin, highly fired, unslipped, decorated essentially with linear or geometric, and rarely animal, designs in black or dark brown which show some influence from the lowland Mesopotamian Ubaid ceramic tradition (Henrickson 1983, 1992). Like Dalma Bichrome and Dalma Streaky, these ceramics are restricted to the Dalma sites of the Central Zagros area, mostly along the High Road. No clear-cut distinction criteria have been posited to discern these two wares from each other, and because of this, they are usually cited together (e.g., Henrickson 1983; Levine and Young 1987). Both painted and plain versions occur. The tempering agent is a fine mineral, but in many instances, it is not visible. The color of these wares in Phase I is exclusively cream, but in Phase II there are more hues. The painted designs are rendered horizontally and in both positive and negative manners. The most common vessel forms of BOB and DUP are various shapes of bowls: open-mouth, deep bowls, bowls with a flaring body, and straight-sided bowls.

Phase II

The remains of this phase were uncovered from a depth of 135 cm to the surface of the site. The badly eroded architectural remains of this phase and underlying Phase I was separated by a 50-cm-thick architectural debris layer, probably of both phases' origin.



Figure 9 Black-on-Buff (BOB) and Dalma-Untempered Wares (DUP).

Architecture

The architectures of Phase II are badly damaged due to soil removing activities by local villagers during past decades (Figure 10). What can be said about the constructions of this phase from its faint mud brick remains is that in terms of general plan and other architectural attributes, the architectural remains of Phase II seem to be similar to those of Phase I, having a rather large room, divided into two smaller spaces by a mud brick wall, and surrounded by several small rooms. Part of the floor of the central room was burnt to orange with a concentration of ash, burnt animal bones, and smudged potsherds.

Ceramics

In total, 4906 sherds were recovered from Phase II (Table 2, Figure 5). The most significant change in the ceramic collection of Phase II is the appearance of two new ceramic types: Dalma Impressed and Dalma Bichrome; both start from the debris layer which separates the architectures of Phase I and Phase II. There are, however, several developments in the preexisting ceramic types that continue through the Phase II to the end of occupation at Nad Ali Beig.

Dalma Impressed. This characteristic ware constitutes 6.1% (# 300) of the ceramic collection of Phase II (Table 2, Figure 5). The heavily chaff- and mineral-tempered fabric of this ware ranges from light red, orange, light brown to buff. Both exterior and interior surfaces are covered by a



Figure 10 The badly eroded construction remains of the Phase II of Trench III.

clay slip, usually in red or orange, but light brown and buff do occur. Sometimes the color of the interior surface differs from the exterior. Impressed decorations on these vessels are dense, usually covering the entire exterior surface except ledged-rim and the bottom (Figure 6a). They appear in different shapes, but mostly as fingertip impressions and horizontal or oblique nail impressions. A large number of this ware in our collection show blackened patches on the exterior surface which suggest they were used for cooking (see also, Hamlin 1975:118). Comparing other Dalma assemblages, the Impressed ware in the Nad Ali Beig collection show a rather wide range of vessel forms, including different shapes of pots, deep bowls with slightly flaring body, basins, low-necked jars, spherical bowls, and cups.

Dalma Bichrome. This rare ware is so far known only from excavation at two sites, Seh Gabi (Level 7) and Nad Ali Beig, with low frequency (Levine and Young 1987:21). It constitutes only 0.2% (# 10) of the ceramic collection of Phase II (Table 2, Figure 5). The fabric of this ware is usually buff to light brown and is tempered only with fine chaff. Both exterior and interior surfaces bear a thick clay slip, usually cream-buff/white to light brown in color (Figure 8a). The painted designs are geometric and appear in any of these three pairs: black-red, black-white, or red-brown. The recognizable vessel forms of this ware are pots, open-mouth bowls, and spherical bowls.

In addition to the foregoing changes in the ceramic assemblages of Trench 3, there are a series of changes in the preexisting ceramic types. Appearance of Dalma Impressed seems to be in expense of the reduction of the Dalma Red Slip frequency, which diminished from 67.4% in Phase I to 53% in Phase II. Interestingly, Dalma Plain Ware increased by almost 7% in frequency in Phase II. Dalma Monochrome also exhibits a significant development through the

Trench 3 sequence. While in Phase I, the painted designs of this ceramic are exclusively linear, including parallel, oblique, or concentric curvilinear bands (Figure 7a), in Phase II they are replaced by a series of complex, geometric designs using motifs such as checkered or hachured lozenges, zigzags, and triangles (Figure 7b). In addition, new vessel forms appear in Phase II, including plates and jars; the former is usually painted on both interior and exterior.

The BOB and DUP underwent a series of changes from Phase I to Phase II. While in Phase I the color of these wares is exclusively cream, in Phase II they appear in several hues, such as light buff, greenish- and brownish-buff. In addition, both BOB and DUP specimens in Phase II are coarser than those of Phase I. There is also a slight decrease in frequencies of these ware in Phase II (Table 2).

Generally speaking, as most researchers have pointed out, Dalma ceramics show a striking homogeneity throughout the northern and central Zagros sites (e.g., Henrickson 1983; Renette 2022).³ This is true as far as the ceramic types, vessel forms, and surface decoration is considered, but laboratory analyses on Dalma ceramics have shown that despite this homogeneity, there are a significant variability among the different types of Dalma ceramics both between sites and among the individual wares of a site in terms of raw materials and technologies (Tonoike 2009). Therefore, it is now clear that Dalma ceramics were essentially a household product, with no verified evidence of exchange between sites. Considering these studies, the apparent homogeneity of Dalma ceramics throughout its territory might have a cultural explanation.

The Dalma ceramic assemblages of Nad Ali Beig are almost identical to those of the key sites of the Central Zagros, i.e., Godin (the XYZ Trench) and Seh Gabi (Mound B, Levels 7–5). Nevertheless, there are some differences between ceramic assemblages of different locales in the Dalma territory (for more details see Bahranipoor 2021). The most apparent difference between ceramic assemblages of Nad Ali Beig and those of the northern Zagros is the presence of four ceramic types of BOB, DUP, Dalma Streaky, and Dalma Bichrome in the former and their lack in the latter. As mentioned before, these four ceramics are found essentially in the sites along the High Road in Central Zagros. The second major difference between Dalma sites of the Central Zagros and those of northern Zagros is seen in the painted designs of Dalma Monochrome ceramic. In the northern Zagros, the painted, solid bands occur frequently (Bahranipoor 2021, Figures 2–3), but they are lacking in Nad Ali Beig. Moreover, the geometric designs of Nad Ali Beig ceramics are rendered with much more details than those of the northern Zagros sites (Bahranipoor 2021, Figure 4). Regarding the details of painted designs of Dalma Monochrome, the sites of Godin, Seh Gabi, Nad Ali Beig, and Gheshlagh are differentiated from the northern sites, including Tappeh Dalma, Baghi, Lavin, Chapar Abad, and Seavan (Figure 1).

Finds

During two seasons of excavations at Nad Ali Beig a variety of artifacts were recovered including chipped stones, groundstone, stone vessels, beads, seal, clay tokens, figurines, and spindle whorls (Figure 11). The materials used for making these items were mostly locally available, such as chert, flint, sandstone, and limestone, but there are some items in the assemblage which were made from exotic materials including obsidian, lapis lazuli, turquoise,

³It should be noted that these researchers always consider Dalma Red Slip, Dalma Plain, Dalma Monochrome, and Dalma Impressed as the four principal ceramic types of this culture.



Figure 11 A selection of various finds from Nad Ali Beig. 1. Painted clay animal figurine; 2-5. Stone rings; 6. Stone stamp seal; 7-8, 10-11. Stone beads; 9. Turquoise bead; 12. Lapis lazuli lump; 13, 15-16. Bone awls; 14. Copper needle; 17. Ceramic cup. (2-3, 6, 8-9, 13, and 15-16. Phase I; 1, 4-5, 7, 10-12, 14, and 17. Phase II).

and copper, indicating incorporation of the site in a wide interregional network of trade from northeastern Iran and Afghanistan to eastern Anatolia. Altogether, 30 pieces of obsidian were found, mostly as bladelets and debitage. No certain obsidian source is yet found in Iran, but there are numerous outcrops of the volcanic glass in Caucasia and eastern Anatolia. Normally, obsidian is rarely reported from the post-6th millennium sites of Iran, except the Central Zagros and the Northwest Region which are closer to the source areas (Barge et al. 2018). Like obsidian, lapis lazuli source is not yet reported from the Iranian Plateau. Five small chunks of this material that were found in Trench 3 might have reached the site from Badakhshan Valley in Afghanistan, which hosts rich sources of this material (Figure 11.12). Other exotic material from Nad Ali Beig is turquoise (Figure 11.9) with no known sources in western Iran. This mineral is found in eastern Iran, especially near Neishabour in the Northeast Region (Gubelin 1966). The only metal artifact from our excavation is a small copper needle recovered from Trench I (Figure 11.14). Copper resources are numerous in the Central Iran zone, around Kerman, but there are some mines in the Northwest Region as well.

A stamp seal was found in Trench 3, which is the only example of such finds from the site (Figure 11:6). The seal, pyramidal in shape, bears a small hole in its tip, probably for hanging, and bears three groups of incised parallel lines on the flat surface. Stamp seals have been rarely reported from the Middle Chalcolithic of the Central Zagros. The only published example comes from the lower levels of Mound B at Seh Gabi which exhibits a zoomorphic pattern (Henrickson 1988, Figure 1). The closest parallel to our sample comes from the surface of Chogha Mish in lowland Khuzestan, tentatively dated to Late Susiana phase (4900–4000 BCE) (Delougaz and Kantor 1996, Plate 234:HH).

THE ¹⁴C DATES

A series of 15 charcoal samples was submitted for ¹⁴C dating; eight samples were analyzed by The University of Tokyo Carbon Dating Laboratory and seven samples by Aarhus AMS Center, Aarhus University, Denmark. All samples, wood/bush charcoal, were taken from Trench 3 sequence, from the depth 41–172 cm below the mound's surface; there is no date for the lowest one meter of the sequence which was excavated in the small sounding. Overall, the dates are in good accordance with their stratigraphic position and they are also rather well fitted with the two phases, including the debris layer separating the two phases (Table 3; Figure 12). Nevertheless, there are some minor discrepancies in the sequential dates that need some explanation. In fact, only two dates, AAR-3265 (Locus 3083) and TKA-19195 (Locus 3081), show a little discordance with the rest of the sequence. Before dealing with these discrepancies, it is worth noting that, first, these 15 dates come from only a 130 cm stratigraphic column, and second, they show a good time overlap.

The date from the sample AAR-3265, taken from Locus 3083 of Phase I, although overlaps with the other dates of this phase, is a little younger than them. This locus, more than 30 cm thick, was a deposit mixed with some mud brick collapse and daily refuse which lay on a stone-paved floor of Phase I. The locus immediately underlies Locus 3052, a mud brick/fills of the 50-cm-thick debris layer separating Phase I from Phase II. As the nature of these two deposits were alike, it is likely that Locus 3083 was in fact part of, and therefore contemporaneous with, Locus 3052 deposit (TKA-19194).

The two dates from Locus 3081, a 30-cm-thick mud brick collapse, filling an architectural space of Phase I, are not in order with their stratigraphic position, although they show only 50 years difference. The sample TKA-19195 taken from a deeper depth than the sample AAR-3220 shows a younger age than the latter. Although no clear sign of disturbances was observed during the excavation, it should be remembered that Locus 3081 belongs to the debris layer which could have been built up through a various way, either during Phase I or Phase II, or both. Meanwhile, we should bear in mind the possibility of old wood effect too, as all of our samples dated were charcoal which could have originated from various wood sources with different ages. This plausible factor could have been the cause of the discordant date of Locus 3083 too.

Despite some minor discrepancies in the ¹⁴C dates of the Trench 3 sequence, no hiatus is seen in the sequence (Figure 12); all dates show a good overlap. Except for the two dates (AAR-3265 and TKA-19195), there is a rather good consistency between the dates of each phase. In general, Phase I can be dated to ca. 5000–4800 BCE and Phase II to ca. 4850–4700 BCE, with some temporal overlap as their cultural materials suggest. The four, somehow inconsistent dates of deposits ascribed to the debris layer, separating Phase I from Phase II, are comparable with those of Phase I and Phase II. This situation can be interpreted as such: while the buildings of Phase I in our excavation area were abandoned and started to crumble, occupation continued in adjacent homes and the location of the Phase I buildings was used as a dumping area by the neighbors. Therefore, the debris layer is a mixed deposit with a complex history of deposition of both Phase I and Phase II materials.

DISCUSSION AND CONCLUSION

Although the excavated sequence of Trench 3 is not too long, it provides significant evidence on the ceramic developments of Dalma Period in the Central Zagros. With the ¹⁴C-dated sequence of Nad Ali Beig and given the changes through its ceramic assemblage, we can suggest the

Table 3 Radiocarbon dates for Nad Ali Beig sequence. Dating performed at University of Tokyo (TKA) and Aarhus AMS Center (AAR); TKA dates are calibrated by OxCal v.4.2 using IntCal13 calibration curve (Bronk Ramsey 2009; Reimer et al. 2013), and AAR dates are calibrated by OxCal v.4.4.2 using IntCal20 (Bronk Ramsey 2020; Reimer et al. 2020).

Lab no.	Provenance (context)	Phase	Depth (cm)	Sample	Context description	Conventional date (BP)	Calibrated date (BC), 1 sigma, (68.2%)	Calibrated date (BC), 2 sigma, (95.4%)
AAR-3057	3018	Phase II	41	Charcoal	Burnt surface	5889±36	4792–4720	4840–4691
TKA-19192	3016	Phase II	45	Charcoal	Deposit on the floor	5898±26	4791–4726	4832–4714
AAR-3043	3028	Phase II	78	Charcoal	Fill deposit	5913±35	4934–4836	4883–4711
TKA-19193	3043	Phase II	88	Charcoal	Beside to the seal, on a beaten floor	5909±26	4799–4728	4837–4721
TKA-19194	3052	Phase I/II debris layer	98	Charcoal	Mudbrick collapse	5935±25	4843–4780	4895–4726
AAR-3199	3052	Phase I/II debris layer	116	Charcoal	Mudbrick collapse	5998±35	4937–4842	4986–4796
AAR-3220	3081	Phase I/II debris layer	115	Charcoal	Mudbrick collapse	5967±37	4903–4794	4946–4730
TKA-19195	3081	Phase I/II debris layer	142	Charcoal	Mudbrick collapse	5932±26	4842–4771	4893–4725
AAR-3248	3082	Phase I	135	Charcoal	Fill deposit	5989±37	4934–4836	4983–4789
AAR-3232	3084	Phase I	134	Charcoal	Deposit on the floor (Space A1)	6015±37	4947–4846	5001–4801
AAR-3265	3083	Phase I	145	Charcoal	Fill deposit	5902±61	4844–4708	4939–4615
AAR-3267	3085	Phase I	145	Charcoal	Deposit on the floor	5970±37	4905–4796	4950–4730
TKA-19197	3093	Phase I	157	Charcoal	Deposit on floor (Space C1)	6009±26	4939–4848	4986–4834
TKA-19196	3091	Phase I	160	Charcoal	Burnt floor	5996±25	4932–4844	4951–4799
TKA-19198	3108	Phase I	172	Charcoal	Fill inside a semicircular stone feature	5993±25	4932–4842	4946–4799

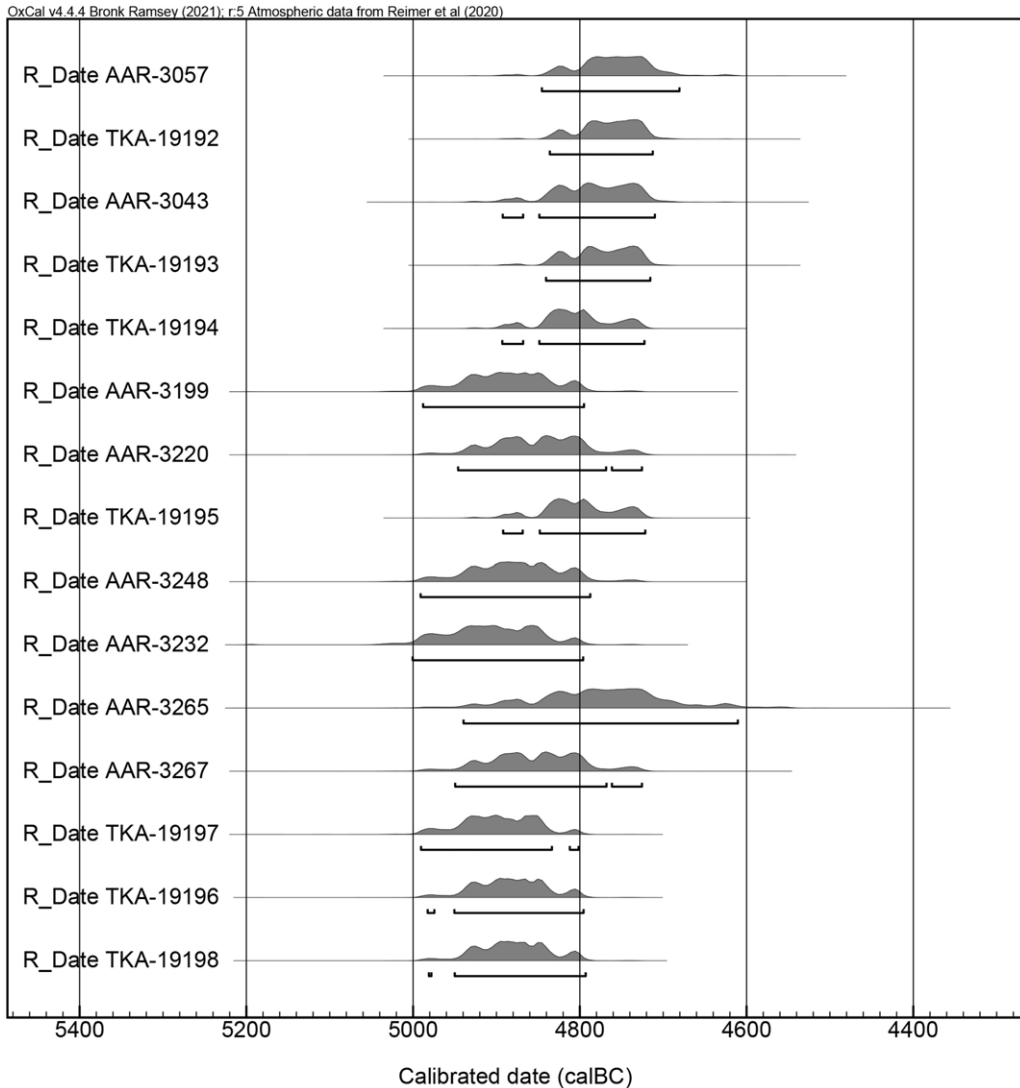


Figure 12 Calibrated radiocarbon dates for the Trench 3 sequence, arranged by phases.

sequential appearance of different types of Dalma ceramic in the sequence. Based on these data and observation, we may suggest that the earliest types of Dalma ceramic are Red Slip/Plain Ware, Streaky, DUP, BOB, and Monochrome with simple, linear painted designs, all seen from the very beginning of the Trench 3 sequence around 5000 BC or a little earlier. Obviously, these ceramic types might be present in even earlier, but not yet discovered, sites. By ca. 4900 BC, or somewhat later, two new types of ceramic appeared, including Dalma Bichrome and Dalma Impressed, along with a new version of Dalma Monochrome characterized by more complex, geometric painted designs.⁴ Regarding the latter development, it should be noted that

⁴The rather late occurrence of Dalma Bichrome in the Trench 3 sequence probably undermines the Renette's viewpoints about this ceramic as the chronological bridge between the Late Neolithic and Early Chalcolithic in the Central Zagros (Renette 2022:139).

Henrickson had already noted some changes through the Dalma ceramic sequence of the XYZ Trench at Godin Tappeh (Henrickson 1983). The trench, approximately 2 × 3 m, was dug largely unsupervised in eighty 20-cm-thick spits during the last season in 1973. Dalma materials were recovered from Spits 63–50, ca. 2.8 m in thickness. Based on her observations, Henrickson tentatively divided the Dalma deposit of the trench into three “phases”: Early Phase (Spits 63–59), Middle Phase (Spits 57–55), and Late Phase (Spits 54–50). In summary, according to Henrickson, Dalma Monochrome exists almost throughout the Dalma sequence of the XYZ Trench, first with simpler motifs similar to those of Dalma Streaky during the Early Phase to more complex motifs in the Middle Phase. It starts to diminish in number through the Late Phase and by the end of the phase it disappears completely. Dalma Streaky, which exists from the very early of the sequence, disappears in the early stage of the Middle Phase while in the later part of this phase Dalma Impressed appears which culminates during the Late Phase (Henrickson 1983:173). In general, Henrickson’s observation on ceramic change in the small collection of the XZY Trench is consistent with what we observe in Trench 3 at Nad Ali Beig. There are, however, some differences between these two insights. For instance, apparently Dalma Bichrome is absent in the XYZ sequence but it is present in the Late Phase at Nad Ali Beig. Or, while Henrickson observed no Dalma Streaky from the mid-sequence upwards, in Nad Ali Beig this ware is present throughout the sequence, although in a very low percentage. Comparing the Henrickson observation of the XYZ Trench ceramic developments and what we observe from Nad Ali Beig sequence, it may be possible that Nad Ali Beig lacks the Henrickson’s Late Phase, because the frequency of Dalma Monochrome in relation to Dalma Impressed in our assemblage is still high, not diminishing to disappearance as she observed in the Late Phase of the XYZ Trench (Henrickson 1983:174).

The new ¹⁴C dates from Tappeh Nad Ali Beig are the first reliable absolute dates for the Dalma period in both Central Zagros and the Northwest Region. However, as Nad Ali Beig is a single-period site which covers apparently part of this period, the available dates do not represent the whole duration of Dalma Period. The earliest available dates of Nad Ali Beig, from the floor of the architecture of Phase I, points to the turn of the sixth millennium BCE, but we should bear in mind that there are no dates for the lowest 1-m-thick deposits excavated in the small sounding to virgin soil. Based on this reasoning, the lowest deposits of Trench 3 could likely be dated to the pre-5000 BCE. As such, and also considering the fact that the beginning of the occupation at Nad Ali Beig is not necessarily coincided with the beginning of the Dalma period, we may suppose that this period started sometime around 5200/5100 BCE in the Central Zagros, if not earlier. Moreover, it should be noted that the relationship between Dalma and its preceding period, i.e., Shahn Abad, in the Central Zagros is not clear. None of the excavated sites in the Central Zagros provided these both periods in a single stratigraphic column. Besides, the time-range of the Shahn Abad period is still debated. There are only three ¹⁴C dates for this period from Mound C in Seh Gabi. Based on Marshall’s analyses, these dates are “unreliable” (Marshall 2012:261); they show a general time-range of 5400–4800 BCE. Evidently, part of this time-range which falls in the early fifth millennium is not true for Shahn Abad period, because, based on the Nad Ali Beig dates, we know that Dalma period was already present around 5000 BCE.

The same problem exists for the ending time-range of the Dalma period. The Seh Gabi and Pisdeli periods succeed the Dalma period in the Central Zagros and Northwest Region, respectively. Recalibration of old dates from these periods give a time-range ca. 4600–4000 BCE (Renette and Mohammadi Ghasriani 2020, Figure 5). Therefore, based on the foregoing

chronological considerations and the new ^{14}C dates for the Nad Ali Beig sequence, we may put the Dalma period between ca. 5200/5100–4600 BCE (see also, Renette 2022).

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REFERENCES

- Aali A. 2007. Excavation at Tappeh Soha Chai [unpublished field report]. Archive of the Iranian Center for Archaeological Research. In Persian.
- Abdollahi M, Niknami K, Hesari M, Sardari A. 2014. The village period and cultural developments of the eastern Central Zagros societies: Archaeological excavations at Qela Gap. *Archaeological Studies* 6(1):67–86.
- Abedi A. 2016. Preliminary report of the second season of excavation at Kul Tepe, north-western Iran. *Journal of Archaeological Studies* 8/1:91–111. In Persian. doi: [10.22059/JARCS.2016.59497](https://doi.org/10.22059/JARCS.2016.59497)
- Abedi A, Eskandari N, Khatib Shahidi H, Sharahi I, Shirzad G. 2014a. New evidence from Dalma and Kura Araxes cultures at Tappeh Qal'e-ye Sarsakhti. *Iran and the Caucasus* 18:101–114. doi: [10.1163/1573384X-20140202](https://doi.org/10.1163/1573384X-20140202)
- Abedi A, Khatib Shahidi H, Chataigner C, Niknami K, Eskandari N, Kazempour M, Pirmohammadi A, Hosseinzadeh J, Ebrahim G. 2014b. Excavations at Kul Tepe (Hadishahr), north-western Iran, 2010: first preliminary report. *Ancient Near Eastern Studies* 51:33–165.
- Abedi A, Omrani B, Karimifar A. 2015. Fifth and fourth millennium BC in north-western Iran: Dalma and Pisdeli revisited. *Documenta Praehistorica* XLII:321–338.
- Alizadeh A. 2006. The origins of state organizations in prehistoric highland Fars, southern Iran: Excavations at Tall-e Bakun. Chicago: The Oriental Institute of the University of Chicago.
- Alizadeh A. 2008. Chogha Mish II: The development of a regional center in lowland Susiana, southwestern Iran, final report on the last six seasons of excavations, 1972–1978. Chicago: The Oriental Institute of the University of Chicago.
- Bahranipoor H. 2018. Reappraisal of cultural interactions between the inhabitants of the Central Zagros with the neighboring regions during the 5th millennium BC based on the archaeological data from the site of Nad Ali Beig [unpublished PhD dissertation]. Tehran: University of Tehran. In Persian.
- Bahranipoor H. 2021. Intra-regional diversity of dalma ceramic tradition based on analysis of the painted Monochrome Ware. *Journal of Research on Archaeometry* 7(1):103–123. In Persian.
- Bahranipoor H. 2022. Report on the first season of rescue excavations at Chapar Abad, Oshnaviyeh [unpublished field report]. Tehran: Iranian Center for Archaeological Research. In Persian.
- Bahranipoor H. 2023. First season of rescue excavation at Chapar Abad. In: Mosadeghi Amini F, Jalali Farshi F, editors. *Proceedings of the 20th annual congress on Iranian Archaeology*. Tehran: Research Institute of Cultural Heritage and Tourism. p. 118–122.
- Bakhshaliyev V. 2018. Archaeological researches in the settlement of Nakhchivan Tepe. *Amisos* 3(4):40–66.
- Bakhshaliyev V. 2020. Relationships between Late Neolithic and Early Chalcolithic age culture of Azerbaijan with north-western Iran (Iranian Azerbaijan). *Tüba-Ar* 27:11–27. In Turkish.
- Balmaki B. 2017. Dalma culture in the Hamedan Plain: stratigraphic excavation at Tappeh Taze Kand in Hamedan Plain. *Iranian Archaeological Research* 12:63–82.
- Barge O, Azizi Kharanaghi H, Biglari F, Moradi M, Mashkour M, Tengberg M, Chataigner C. 2018. Diffusion of Anatolian and Caucasian obsidian in the Zagros mountains and the highlands of Iran: elements of explanation in “least cost path” models. *Quaternary International* 467:297–322. doi: [10.1016/j.quaint.2018.01.032](https://doi.org/10.1016/j.quaint.2018.01.032)
- Bronk Ramsey C. 2009. Bayesian analysis of radiocarbon dates. *Radiocarbon* 51(1):337–60. doi: [10.1017/S0033822200033865](https://doi.org/10.1017/S0033822200033865)
- Bronk Ramsey C, Heaton T, Schlolaut G, Staff R, Bryant C, Brauer A, Lamb H, Marshall M, Nakagava N. 2020. Reanalysis of the atmospheric radiocarbon calibration record from Lake

- Suigetsu, Japan. Radiocarbon 62(4):989–999. doi: [10.1017/RDC.2020.18](https://doi.org/10.1017/RDC.2020.18)
- Burney C. 1964. The excavations at Yanik Tepe, Azerbaijan, 1962: third preliminary report. Iraq 26(1):54–61.
- Delougaz P, Kantor HJ. 1996. Chogha Mish, Vol. 1: the first five seasons of excavations 1961–1971. Part 2: plates. Alizadeh A, editor. Chicago: The Oriental Institute of the University of Chicago.
- Falahian Y, Nozhati K. 2016. Rescue Excavation at Tappeh Baghi, Sardasht. In: Chubak H, editor. Proceedings of the 15th annual congress on Iranian archaeology. Tehran: Research Institute of Cultural Heritage and Tourism Press. p. 492–498. In Persian.
- Goff CL. 1971. Lūristān before the Iron Age. Iran 9:131–152.
- Gopnik H, Rothman MS. 2011. On the High Road: the history of Godin Tepe, Iran. Costa Mesa: Madza Publisher, Inc.
- Gubelin E. 1966. The ancient turquoise mines in Iran. Gems and Gemology (Spring):3–13.
- Hamlin C. 1975. Dalma Tepe. Iran XIII:111–128.
- Hejebri Nobari A, Binandeh A, Neyestani J, Vahdati Nasab H. 2012. Excavation at Lavin Tepe in northwest Iran. Ancient Near Eastern Studies 49:95–117.
- Henrickson EF. 1983. Ceramic styles and cultural interaction in the Early and Middle Chalcolithic of the Central Zagros, Iran [PhD dissertation]. Department of Anthropology, University of Toronto.
- Henrickson EF. 1985. An updated chronology of the early and middle Chalcolithic of the Central Zagros highlands, western Iran. Iran 23:63–108.
- Henrickson EF. 1986. Ceramic evidence for cultural interaction between Chalcolithic Mesopotamia and western Iran. In: Kingery WD, editor. Technology and style: ceramics and civilization II. Columbus: American Ceramic Society. p. 87–132.
- Henrickson EF. 1988. Chalcolithic seals and sealings from Seh Gabi, Central western Iran. Iranica Antiqua 23:1–19.
- Henrickson EF. 1989. Ceramic evidence for cultural interaction between the Ubaid tradition and the Central Zagros highlands, western Iran. In: Henrickson EF, Thuesen I, editors. Upon this Foundation: The Ubaid Reconsidered. Copenhagen: Carsten Niebuhr Institute. p. 369–404.
- Henrickson EF. 1992. Ceramics: the Chalcolithic Period in the Zagros Highlands. In: Yarshater E, editor. Encyclopedia Iranica V. 5, fascicle 3. p. 278–282.
- Henrickson EF, Vitali V. 1987. The Dalma tradition: prehistoric inter-regional cultural interaction in highland western Iran. Paléorient 13/2:37–45.
- Hole F. 1977. Studies in the archaeological history of the Deh Luran Plain: the excavation of Chogha Sefid. Ann Arbor: University of Michigan.
- Hole F. 1987. Archaeology of the Village Period. In: Hole F, editor. The archaeology of western Iran: settlement and society from prehistory to the Islamic Conquest. Washington, DC: Smithsonian Institution Press. p. 29–78.
- Hole F, Flannery KV, Neely J. 1969. Prehistory and human ecology of the Deh Luran plain: an early village sequence from Khuzistan, Iran. Ann Arbor: University of Michigan.
- Khatib Shahidi H, Heidarian M, Basafa H. 2012. The prehistoric cultures of the Songhor Plain. Archaeological Reports 8:31–46.
- Levine LD, Young TC. Jr. 1987. A summary of the ceramic assemblages of the central western Zagros from the Middle Neolithic to the Late Third Millennium B.C. In: Préhistoire de la Mésopotamie. Paris: Centre National de la Recherche Scientifique Colloques Internationaux. p. 5–54.
- Marshall JL. 2012. Missing links: Demic diffusion and the development of agriculture on the central Iranian Plateau [PhD dissertation]. Durham University. Available at Durham E-Theses: Online: <http://etheses.dur.ac.uk/3547/>
- Matthews R, Fazeli Nashli H. 2022. The archaeology of Iran, from the Palaeolithic to the Achaemenid Empire. London and New York: Routledge.
- Mortensen P. 2014. Excavations at Tepe Guran: the Neolithic Period. Leuven: Peeters.
- Motarjem A. 2014. Report on rescue excavation at Tappeh Gheshlagh. Report prepared for the Iranian Center for Archaeological Research. In Persian.
- Pollard M, Davoudi H, Mostafapour I, Valipoor H, Fazeli Nashli H. 2012. A new radiocarbon chronology for the Late Neolithic to Iron Age in the Qazvin Plain, Iran. International Journal of Humanities 19(3):110–151.
- Pollard M, Fazeli Nashli H, Davoudi H, Sarlak S, Helwing B, Saeidi Anaraki F. 2013. A new radiocarbon chronology for the North Central Plateau of Iran from the Late Neolithic to the Iron Age. Archäologische Mitteilungen aus Iran und Turan 45:27–50.
- Rahimi Sorkhani R, Niknami k, Eslami, M. 2016. Non-Dalma ceramics in Dalma contexts: archaeological recognition and laboratory explanation. Case study: Soha Chai, Zanjan. Journal of Archaeological Study 8/2:53–70.
- Rahimi Sorkhani R, Eslami M. 2018. Specialized pottery production in Dalma tradition; a statistical in pottery analysis from Soha Chai Tepe, Zanjan Iran. Journal of Archaeological Science: Reports 17: 220–234. doi: [10.1016/j.jasrep.2017.11.007](https://doi.org/10.1016/j.jasrep.2017.11.007)
- Reimer PJ, Bard E, Bayliss A, Beek JW, Blackwell PG, Bronk Ramsey C, Buck CE, Cheng H, Edwards RL, Friedrich M, et al. 2013. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887. doi: [10.2458/arz_js_rc.55.16947](https://doi.org/10.2458/arz_js_rc.55.16947)

- Reimer PJ, Austin WEN, Bard E, Bayliss A, Blackwell PG, Bronk Ramsey C, Butzin M, Cheng H, Edwards RL, Friedrich M, et al. 2020. The intCal20 northern hemisphere radiocarbon age calibration curve (0–55 cal kBP). *Radiocarbon* 62(4):725–757. doi: [10.1017/RDC.2020.41](https://doi.org/10.1017/RDC.2020.41)
- Renette S. 2022. Defining Dalma: an incipient mountain identity? *Paléorient* 48.1:131–153.
- Renette S, Mohammadi Ghasrian S. 2020. The central and northern Zagros during the late Chalcolithic: an updated ceramic chronology based on recent fieldwork results in western Iran. *Paléorient* 46.1-2:109–132.
- Renette S, Abu Jayyab K, Gibbon E, Lewis MP, Abdulkarim Qadir Z, Cabral R, Tomé AG. 2021a. Late Chalcolithic ceramic development in southern Iraqi Kurdistan: the stratigraphic sounding at Kani Shaie. *Iraq* 83:119–166.
- Renette S, Khayani A, Levine LD. 2021b. Chogha Maran: a local center of Chalcolithic and Early Bronze Age in the Central Zagros. *Iranica Antiqua* LVI:1–169. doi: [10.2143/IA.56.0.3290273](https://doi.org/10.2143/IA.56.0.3290273)
- Renette S, Lewis MP, Wencel MM, Farahani A, Tomé A. 2022. Establishing an absolute chronological framework for the late Chalcolithic to early Bronze age in Iraqi Kurdistan: Radiocarbon dates from Kani Shaie. *Radiocarbon*. doi: [10.1017/RDC.2022.72](https://doi.org/10.1017/RDC.2022.72)
- Rothman MS, Badler V. 2011. Contact and development in Godin Period VI. In Gopnik H, Rothman MS, editors. *On the High Road: the history of Godin Tepe, Iran*. Toronto: Royal Ontario Museum/Mazda Press. p. 67–137.
- Roustaei K, Rezvani H, Heydari S. 2002. Kani Mikail: a seasonal cave site of the Middle Neolithic period in Kordestan, Iran. *Antiquity* 76:935–36. doi: [10.1017/S0003598X0009164X](https://doi.org/10.1017/S0003598X0009164X)
- Roustaei K, Azadi A. 2017. Cultural relation between the Central Zagros and Central Plateau during the fourth millennium BCE: evidence from Shat Ghillah, Malayer. *Archaeological Research of Iran* 14:39–58. In Persian.
- Saed Moucheshi A, Zamani Dadaneh M, Ghasemi M, Karimi Z. 2017. Stratigraphic excavation at Tappeh Nemshir, Behn: a site in western Iran. *Pazhohesh-ha-ye Bastanshenasi Iran (Archaeological Research of Iran)* 12:43–62. In Persian.
- Sharifi M. 2020. Archaeological excavations at Tappeh Gheslugh, Bijar. Tehran: Research Institute of Cultural Heritage and Tourism. In Persian.
- Sharifi M, Motarjem A. 2018. The process of cultural change in the Chalcolithic period in the highlands of Western Iran at Tepe Gheslugh. *Documenta Praehistorica* XLV:86–99.
- Solecki RL, Solecki RS. 1973. Tepe Seavan, a Dalma Period site in the Margavar Valley, Azerbaijan, Iran. *Bulletin of the Asia Institute* 3:98–117.
- Stein GJ. 2018. Excavations at Surezha, Erbil Plain, Kurdistan Region, Iraq. *Oriental Institute Annual Report 2017–18*:29–43.
- Stein GJ, Fisher MT. 2020. Surezha Excavations 2019, Erbil Plain, Kurdistan Region, Iraq. *Oriental Institute Annual Report 2019–20*:127–145.
- Swiny S. 1975. Survey in North-West Iran, 1971. *East and West* 25 (1/2):77–97.
- Tobler AJ. 1950. Excavations at Tepe Gawra. Volume II, Levels IX–XX. Philadelphia: University of Pennsylvania Press.
- Tonoike K. 2009. Beyond style: petrographic analysis of Dalma ceramics in two regions of Iran. UMI Dissertation Publishing: Yale University.
- Tonoike K. 2012. Petrographic analysis of the 6th millennium B.C. Dalma ceramics from northwestern and central Zagros. *Iranian Journal of Archaeological Studies* 2/2:65–82.
- Voigt MM. 1983. Hajji Firuz Tepe, Iran: the Neolithic settlement. *Hasanlu Excavation Reports, Vol. 1. Monograph No. 50*. Philadelphia: University Museum, University of Pennsylvania.
- Voigt MM, Dyson RH. Jr. 1992. The chronology of Iran, ca. 8000–2000 B.C. In: Ehrich RW, editor. *Chronologies in Old World archaeology*. Chicago: Chicago University Press. p. 122–178.
- Young TC Jr. 1963. Dalma Painted Ware. *Expedition* 5/2:38–39.
- Young TC Jr. 1969. Excavations at Godin Tepe: first progress report. Ontario: Royal Ontario Museum, Art and Archaeology Occasional Papers No. 17.
- Young TC Jr, Levine LD. 1974. Excavations of the Godin Project: second progress report. Ontario: Royal Ontario Museum, Art and Archaeology Occasional Papers No. 26.
- Zamani Dadaneh M, Renette S, Saed Moucheshi A. 2021. Connections between the northern Zagros and Mesopotamia during the fifth millennium BCE: new insights from Tepe Namashir in western Iran. *Origini* 45:7–34.