

## **Ceremonial plant consumption at Middle Bronze Age Büklükale, Kırıkkale Province, central Turkey**

Andrew S. Fairbairn<sup>1</sup>, Nathan J. Wright<sup>1,2</sup>, Mark Weeden<sup>3</sup>, Gojko Barjamovic<sup>4</sup>, Kimiyoshi Matsumura<sup>5</sup>, Ron Rasch<sup>6</sup>

<sup>1</sup>The University of Queensland, School of Social Science, Michie Building, St Lucia, Brisbane, Australia  
[a.fairbairn@uq.edu.au](mailto:a.fairbairn@uq.edu.au)

<sup>2</sup>McDonald Institute for Archaeological Research, University of Cambridge, Downing St, Cambridge, United Kingdom

<sup>3</sup>Department of History, School of History, Religions and Philosophies, School of Oriental and African Studies, Thornhaugh Street, London, United Kingdom

<sup>4</sup>Department of Near Eastern Languages and Civilizations, Harvard University, 6 Divinity Avenue, Cambridge, MA 02138, U.S.A.

<sup>5</sup>Japanese Institute of Anatolian Archaeology, Çağırkan, Kırşehir, Turkey

<sup>6</sup>The University of Queensland, Centre for Microscopy and Microanalysis, St Lucia, Brisbane, Australia

### **Abstract**

A shaft-like room at the Middle Bronze Age site of Büklükale in central Turkey preserved a rich archaeobotanical assemblage of charred and mineralised plant remains, dominated by fruits, spices and nuts mixed with probable bread and wood charcoals. The remains were recovered in association with numerous ceramic vessels, jewellery, and exotic artefacts. We combine identification and analysis of the seeds and wood charcoals contained in this deposit with studies of Old Assyrian and Hittite textual records to investigate the circumstances of the assemblage's formation and its significance for further understanding trade and plant consumption in Bronze Age Anatolia. We present the earliest archaeobotanical example in the region of rare and exotic plant species being consumed in the context of one or more social gatherings, including those possibly linked to ceremonial or ritual events. This offers new insights into the role of plants in the economic and social life of the southwest Asian Bronze Age, as well as the role of commensality and feasting in early states.

### **Keywords**

Anatolia, archaeobotany, exchange networks, Hittite texts, Old Assyrian texts, feasting

## 1. Introduction

Central Anatolia's Bronze Age (c. 3000-1200 B.C.) saw the development of centralised, hierarchically structured societies whose urban elites harnessed economic surplus to underpin political and social status. Research has emphasised the important role of ceremonial consumption in the development and maintenance of social order in the Bronze Age, both fuelled by and driving the growth of the long-distance trade and exchange networks that linked disparate geographical regions (Wengrow 2010). This is best documented in the Middle Bronze Age (MBA) cuneiform records of the Assyrian traders found at the site of Kültepe in eastern Cappadocia (Larsen 2015). Archaeological evidence for the exchange and consumption of plant foods and other plant products is relatively sparse in the Anatolian Bronze Age (see Dörfler et al. 2011; Fairbairn in press), although the textual record does provide evidence of such practices. This paper provides a study of plant consumption at Büklükale, site of an ancient urban settlement 100 km southeast of Ankara (Matsumura 2017). We focus on the record of plant foods and wood fuels found in a shaft-like structure whose context and finds indicate deposition resulting from one or more social gatherings. Here we detail the archaeobotanical remains from the structure and consider them alongside Bronze Age textual sources to understand further the origins of the assemblage and its significance for the economic and cultural history of the site and its region.

## 2. Settlement and historical background

Since 2009, the Japanese Institute of Anatolian Archaeology (JIAA) has conducted excavations at the c. 30 Ha settlement at Büklükale on the western bank of the Kızılırmak River in Kırıkkale Province (Matsumura 2017) (Fig. 1a). Controlling an important crossing of the Kızılırmak (Fig. 1b), Büklükale has been associated with the traffic node of Bronze Age Wahšušana (Barjamovic 2010), the copper market of Durhumit (Forlanini 2008), and the city of Ninašša (Corti 2017). All three cities are attested in early second millennium documents. A walled lower town is overlooked by a high rocky outcrop adjacent to the river (Fig. 1b) upon which was built a sequence of buildings dating to the MBA and Late Bronze Age (LBA) surrounded by a 7m high cyclopean wall (Fig. 1c). The architectural sequence in the upper area includes the foundations of a large structure around 1980 BC, which contained magazines of storage pithoi consistent with centralised storage (Fig. 1c) (Matsumura 2018: 26). Its destruction around 1870 BC was followed by rebuilding and then a second destruction c. 1680 BC. Occupation continued into the Hittite Empire (Matsumura 2017) with the discovery of a diplomatic letter perhaps indicative of the continued political significance of the site (Weeden 2013).

### FIG. 1

Archaeological evidence suggests that Büklükale was an important settlement in the MBA. Current historical knowledge of Anatolia during this period is dominated by a record of ca. 23,000 cuneiform tablets from Kültepe near Kayseri (ancient Kaneš). These texts were produced by an expatriate community of merchants coming from the city-state of Assur in northern Iraq and detail the trade system during a 30-year time period ca. 1895-1865 BC (see Barjamovic et al. 2012). Anatolia's political system in the early centuries in the second millennium BC was one of a mosaic of small states, consisting in most cases of a single city and its supporting villages, ruled by a royal couple and a large group of palace officials (Veenhof 2010). Archaeological evidence demonstrates that both these states and the long-distance trade connecting them significantly predate the Assyrian records from Kültepe (Ezer 2014). Gradual territorial and political centralization from the mid-18<sup>th</sup> BC onwards saw the end of this political system across central Anatolia (Barjamovic et al. 2012), and by the mid-to-late 17<sup>th</sup> century BC the region came under the emerging state of Hattusa.

## 3. Materials and methods

### 3.1. Site context

This paper considers the archaeobotanical record from Phases 3 and 4 of Room 62 (R62), a walled rectangular shaft adjacent to the outer wall of Büklükale's upper building complex dated roughly between 2000 and 1650 BC (Fig. 1c; Matsumura 2015: 672; 2018: 26). Extending beneath the contemporary floor level, the room had four phases of use (Fig. 2a). The lower two (Phases 3 and 4) date broadly to the MB III (c. 1800-1650 B.C. (see Yakar 2011)) and were made up of deposits containing thousands of ceramic cups/small bowls interspersed with discrete deposits of ash-rich and burnt debris (Phase 3 and upper Phase 4; see Fig. 2b). They covered a damp basal deposit containing small quantities of ashy material (lower Phase 4). Two samples come from a discrete dump of ash-rich soil within the ceramic deposits: from PL90 (PL = Provisional Layer, equivalent to a context) and from PL88 above it. PL88 was dominated by large charcoal fragments (Fig. 2b). PL93 and PL94 instead came from ash-rich deposits in Phase 4 at the base of the sequence also associated with the deposition of many cups, and in this case also with a crystal bowl, ostrich shell fragments, and a decorated jaguar head (Matsumura 2018: 19). The density and mixing of the ceramic objects, and the lack of tip lines that characterise episodic, everyday rubbish disposal (see Fairbairn and Omura 2005), suggest that deposition took place over a short period of time, probably in a closely related set of events.

FIG. 2

### 3.2. Archaeobotanical methods

Plant remains were recovered by flotation with 1mm heavy residue mesh and <100 µm flotation mesh. All sampled sediment from PL93 and PL94 was processed with sub-samples analysed from PL88 and PL90 sufficient to procure >500 identifiable seeds and fruits. A minimum of 200 wood charcoal fragments was analysed from each context, including fragments from the flotation heavy residue. Seeds and charcoals were identified in comparison to the reference collection at The University of Queensland and published sources (e.g. Heiss 2009; Schweingruber et al. 2004). Images and chemical analysis, the latter to understand the preservation process of mineralised remains, used a Hitachi SU3500 scanning electron Microscope (SEM) operated at 25kV accelerating voltage, in low vacuum mode at 60Pa pressure, using an Oxford X-Max SDD energy dispersive x-ray spectrometer (EDS) with AZtec software for elemental analysis.

### 3.3 Textual and historical data and methodology

Textual references to plants and their uses were derived from a survey of published MBA and LBA cuneiform archives from central Anatolia. Some 11,000 of the 23,000 Old Assyrian texts dated 1895-1865 BC from Kültepe were available for this study. Their nature as commercial records documenting an international overland trade means that references to plant products and their uses are rare (Dercksen 2008a, 2008b). Plant foods are better attested in texts from the later Hittite state (tablets dating late 15<sup>th</sup> to early 12<sup>th</sup> c. B.C.), including those edited in the series *Texte der Hethiter* (THeth) and *Studien zu den Bogazköy-Texten* (StBoT), and the online editions of 368 ritual texts hosted by Hethitologie Portal Mainz ([www.hethiter.net](http://www.hethiter.net)). In addition, a survey of relevant secondary literature was used, chiefly Demirel and Çakılçioğlu 2017, Haas 2003, Hoffner 1974 and Stivala 2004.

Using textual data to understand the assemblage in R62 is difficult, though not impossible, provided we acknowledge the limits of our analysis (Besnier et al. 2012). Identification of plant-names in the Kültepe and Hittite texts is frequently problematic, being informed by discussions of the use-contexts of the relevant words elsewhere in ancient records. In addition, plant-names, like most words, can be written in Hittite cuneiform, using either phonetic Hittite, or Sumerian and Akkadian writings (Hoffner 1974) and their identification uses a variety of methods, all of which are uncertain. They include Sumerian or Akkadian meanings that may be called upon if known, the similarity of Hittite words to culture words, the proposed

etymological analysis of Hittite words, and the use contexts in which words occur, particularly in ritual texts. We also cannot be sure that any rituals and festivals described on clay tablets at Hattusa were performed in the way they were written down. They represent the curation and manipulation of textual traditions by scribes and are not direct evidence for the ritual practice itself (Christiansen 2006; Collins 2014; Miller 2004).

#### **4. Evidence for the exploitation of crops, seeds, fruits and nuts**

##### **4.1 Archaeobotanical seed assemblages (Table 1, Figs. 3-7)**

A wide range of seeds, nutshells and fruits was preserved, including charred and mineralised specimens, the former derived from burning, the latter from mineral replacement of plant tissues after deposition (see 4.2). The seed sum (n=840-1412) and number of seeds per litre (15.31-54.31) were both high (Table 1) in all deposits compared to contemporary nearby settlements (e.g. Fairbairn 2014; Fairbairn et al. 2017). PL90 and PL88 contained a greater proportion and number of charred than mineralised seeds, while the reverse was true for PL94 and PL93 (Fig. 3). The latter were dominated by cereal grain, chaff and weed seeds, lacking charred fruits and nuts (Fig. 4), but did contain a large quantity of carbonate-rich hackberry (*Celtis*) fruit stones, rare for this period in Anatolia (Table 1). PL90 and PL88 contained a greater richness of taxa and higher abundance of burnt plant remains, including cereals, chaff, weed seeds and straw. It also contained a large quantity of burnt fruits and herb/spice seeds drawing great contrast to the deposits below (Fig. 4).

Wheat remains dominated the modest crop assemblages, with naked wheat, including hexaploid bread wheat (*T. aestivum*) using chaff characteristics, and hulled barley, including six row forms, most abundant in the upper assemblages. Hulled wheat species (einkorn and emmer) were better represented in the earlier contexts. A few seeds of lentil (*Lens culinaris*), pea (*Pisum sativum*), and bitter vetch (*Vicia ervilia*) were also found alongside a wide range of wild plant seeds, usually preserved in small quantities per taxon. These include plants of disturbed places and/or agricultural weeds, such as the goosefoot species, wild legumes, and members of the cabbage and daisy family. Also present were several wetland species including sedges (*Carex* sp.) and pondweed (*Potamogeton* sp.), the latter derived from environments with standing water.

The charred fruit and nut assemblage was abundant and taxa rich. Charred grape (*Vitis vinifera*) seeds, including immature forms and stalks, were identified alongside numerous fig (*Ficus carica*), bramble/raspberry (*Rubus* spp.), plum (*Prunus domestica*), and domestic almond (*Amygdalus dulcis*) remains. Fleshy remains from a pear/apple and probable fruit flesh suggest the burning of whole fruits. Grape seeds with flesh attached were absent, and it is unclear whether grapes were charred whole (fresh or as raisins) or simply as seeds. Some rarities were present, including the earliest Anatolian examples of melon/cucumber (*Cucumis melo/sativus*; Fig. 7i), also preserved mineralised, and a large assemblage pomegranate seeds (*Punica granatum*; Fig. 7f), a find rare in this period (Fairbairn in press). Large quantities of burnt seeds of black nightshade (*Solanum nigrum*) are probably indicative of its use as an economic plant in this context, as it is known as a food and medicine in recent and historic sources (see Edmonds et al. 1997, 53). Unusually, large quantities of charred seeds from sumac (*Rhus coriaria*), coriander (*Coriandrum sativum*), and dill (*Anethum graveolans*; Fig 7b) were found in PL90 and PL88, the latter two being the earliest recorded finds in Anatolia, and among the earliest in southwest Asia.

Also preserved in PL88 and PL90 were numerous small fragments of burnt composite plant matter. SEM analysis showed the presence of numerous fragments of cereal bran, including transverse cells characteristic of wheat with characteristic irregular thickenings and pores along the cell walls (Fig. 7c; see Heiss 2014; Heiss et al 2017). Also present were fragments of cereal epidermis similar to that from wheat chaff (Fig. 7d) and several fragments contained distinctive air cavities, most of which were between 200

and 400µm in diameter (7e). The fragments are thus from ground cereal elements, including grain and chaff, and derive from a processed cereal product, given the air cavities possibly bread. One fragment contained a dill seed which could be a flavouring (see Heiss et al 2017).

The mineralised assemblages lacked identifiable crops or chaff/straw and were dominated by fruits, nuts, herbs and spices (Table 1, Fig. 5). Mineralised wild/weed seeds were present in moderate quantities in PL93 and PL94, and in small quantities in PL90. A major difference between the two was the dominance of grape in PL90 and PL88, with PL94 and PL93 containing a wider variety of fruit seeds, most commonly fig, but also pomegranate (Fig. 7f), and many mineralised herb/spice seeds, especially dill (*Anethum graveolans* (Fig. 7b) and coriander (Fig. 7c). Skeletonised grape seed (*Vitis vinifera*) were abundant and preserved in a variety of states (Fig. 6; Fig. 7a), including brown specimens in PL94 and PL93, and as blackened forms in PL90 and PL88. This form of preservation sees selective mineralisation of the embryo and loss of the outer testa (Kroll 1999). The blackened specimens usually had a lighter coloured interior and some were surrounded by their charred testa (Fig. 7a) or included charred fragments stuck to their surfaces.

Among the mineralised remains in PL94 and PL93 were seeds of sesame (*Sesamum indicum*), identified by their characteristic shape and surface pattern (Fig. 7g-h). These are the earliest known in Anatolia, with only one other verified find from earlier archaeobotanical samples in the region (Charles 1993). They were found alongside mineralised dill, coriander (Fig. 7c) and melon/cucumber (Fig. 7i). Seeds of *Cucumis melo* (melon) and *C. sativus* (cucumber) are notoriously difficult to separate (Bates and Robinson 1995) and the seeds could come from either species. Both have been claimed in Sumerian and Hittite texts, though recent research suggests that melon is the most likely, as cucumber was introduced into western Eurasia via Persia in the Medieval period, earlier references potentially referring to snake melon (Paris 2016).

#### 4.2 EDS results

EDS spectra were obtained from a brown mineralised grape seed recovered from PL94 and a blackened grape seed recovered from PL88 which retained fragments of its charred testa over a mineral endocarp with a blackened surface and brown interior (Fig. 7a). Several assays were recovered from each tissue in the specimens, with values from the surface and interior of the brown mineralised specimen (PL94) having no statistically significant difference. The spectra showed that the specimens differed in chemical composition (Fig. 9; Table 2), though mineralisation was facilitated primarily by the precipitation of calcium carbonate, with calcium phosphate also present. The major difference between the specimens was in the carbon content, which was greatly enhanced in the blackened seed from PL90, in both the endosperm and testa. Nitrogen was also present in the outer layer of the testa indicating the presence of organics.

#### 4.3 Textual references to the recorded plants

The grains and legumes found in R62 are referred to and grouped together in Hittite ritual texts as "seeds", along with cumin, coriander, malt and pomegranates (Hoffner 1974: 62, 78). The primary words for cereals are *halki-*, the generic term for "grain" but also used specifically for "barley" (Sumerian ŠE, Hoffner 1974: 60-65; Haas 2003: 381); *ZÍZ-tar* (Sumerian writing, Hittite *hattar*<sup>2</sup> HWb<sup>2</sup> H 367) is likely to represent "(bread) wheat" rather than emmer (Hoffner 1974: 68-9, supported by Nesbitt 1995: 78). Einkorn-wheat is probably associated with the word *kant-*, which was "fed to horses but not used for bread" (Hoffner 1974: 73), while *kars-* seems to denote yet another form of wheat, and *seppit-* and *ewan* are possibly further barley types. The main terms for legumes are disputed in their precise referents, but all seem to share Sumerian writings based on the element GÚ: GÚ.GAL "chick pea?", GÚ.TUR "lentil?", GÚ.GAL.GAL (Hittite *sumessar*) "broad bean?", GÚ.SES "bitter vetch?" (Hoffner 1974: 95-102). It is unclear where the "pea" fits into this series (see Haas 2003: 360), also the *parhuena-*, which could have been a grain or a legume (CHD P 148-150). Bread

could be made of cereals and legumes, although not all of them were used for this purpose and 138 names for different types of bread are attested (Hoffner 1974: 149-209).

The main proposal to identify "dill" with a Hittite word is based on an alleged parallel to the formation of Turkish *dere otu* "stream herb" and Hittite *nāru*<sup>SAR</sup> "river herb". The latter occurs only once in a list of plants "of the garden" in a medicinal bag (KBo 13.248; Ertem 1974: 48; Stivala 2004: 43; contra CHD L-N 396) and is a homophone of the Akkadian word for "river". This is not strong evidence, and "dill" may be hiding behind one of the other garden plants in the list. The fact that dill is found together with probable remains of bread in R62 may offer clues for its identification. The rare herb *tawati*<sup>SAR</sup> also occurs in the garden list and is probably contained in the bread designation <sup>NINDA</sup>*tawataimi*- (Hoffner 1974: 187). However, an early 14<sup>th</sup> century B.C. vocabulary text from Ortaköy pairs *tawatis* with Sumerian and Akkadian words usually understood to mean "fenugreek" (*tawatis* = Akkadian *šambaliltu* = Sumerian <sup>U</sup>SULLIM based on an alleged etymological connection with Aramaic *pelilta*; Dalley et al 1976: 51; Süel and Soysal 2003: 355-356; Giusfredi 2012: 54). Neither the etymological connection nor the referent as used in the Hittite understanding of the vocabulary text are secure. In fact the herb *tawati*<sup>SAR</sup> could be "dill".

Another plant "of the garden" in the same medicinal bag is coriander, Sumerian <sup>ŠE</sup>.LÚ<sup>SAR</sup> = Akkadian *kisibirritu/kisibirru* (cf. Arabic *kazbira*), probably = Hittite *tarpatarpa*- (cf. Miller 2004: 68). Coriander and assorted cereals, spices and legumes are included in a description of a burnt offering of birds cast into a pit as part of a ritual to purify a house by appeasing the infernal deities (KBo 10.45 iii 48-55), although it is not clear from the broken text if the plants are actually burned as well as the birds: "Barley, wheat, *seppit*-grain, *p[ar]huena*-grain, chick peas, broad beans, lentils, *karas*-grain, malt, beer-bread, coriander, *apr[ico]t(?)*, white cumin, black cumin, *titapala*-seed, salt, *lakkarwan*-plant, *seniya(?)*-plant, a little (of) [ea]ch, and all these [he ...]" (translation Collins 2003: 170). The Old Assyrian memorandum OIP 27, 55 with its partial duplicate BIN 4, 162 from Kültepe list half a *sila* (ca. 0.5 L) of coriander worth a quarter shekel of silver, beside cumin and *kuddimmu*, a type of salt or lye, perhaps potash.

Sumac has not yet been identified in Hittite and the Akkadian remains debated. A case has been made by Scurlock (2008: 354) to identify it with the word "*kammu*" based on its use in tanning. The plural of the word *kà-mu-e* may occur in the Old Assyrian private letter (CCT 3, 18b), alongside olive oil (*sardum*): "Buy and send me 1 l. of *k.* and 1 l. of olive oil," thus providing two ingredients for the traditional condiment *za'atar* (cf. Fales 2012: 237).

The second most common taxon in PL90 and PL88 is grape. However, grape does not appear often in Hittite ritual texts compared to the raisin – literally "dried grape" (<sup>GIŠ</sup>GEŠTIN.HÁD.DU.A) – which is used in combination particularly with figs and pomegranate, with which it was used in combination to attract deities to sacrificial locations. Fig, the third most common plant in R62, is written with the Sumerogram <sup>GIŠ</sup>PÈŠ (Hoffner 1974: 116; Haas 2003: 272-275) and the Hittite word is unknown (Hoffner 1967: 43 fn. 58). The word for "pomegranate" is thought to be *nurati*- (CHD L-N 475), due to its similarity to the Hurrian word for the same item *nuranti* (Laroche 1978-9), and among its uses is in an oracle text where it is an offering to a deity (IBoT 2.129 obv. 31, 33). <sup>GIŠ</sup>NU.ÚR.MA is the Sumerian writing, which is regularly used instead of spelling out the Hittite word in Hittite language texts (Hoffner 1974: 119-120; Haas 2003: 269-270). Pomegranate appears twice in the Old Assyrian commercial records. The memorandum AKT 5, 57 refers to 80 fruits in a small shipment that also included wool, locally produced Anatolian textiles (*pirikannu*), two imported textiles, two scarves, a couple of saddle bags, and 10 pounds of olive oil (*sardum*). The shipment is separate from, but probably related to, goods that are said to be "available in [the city] Durhumit." The second mention occurs in the commercial memorandum OIP 27, 55, quoted above, which lists 210 pomegranates at the price of one shekel of silver (equal to the price of c. 300 loaves

of bread, cf. Garelli 1963) in a long series of entries beside onion, myrtle, cedar, coriander, cumin, potash? (*kuddimmu*), thyme (*hašuānum*), edible crocus bulbs (*andahšum*), straw, and several finished items (Ulshöfer 1995 no. 489). The price suggests that pomegranate was a widely available seasonal commodity.

Plum (see below under 5.2) and apple occur in small amounts in PL88 and PL90. Apple was usually written with the Sumerian logogram <sup>GIŠ</sup>HAŠHUR and is encountered commonly in Hittite ritual texts. The Hittite word is <sup>GIŠ</sup>*sam(a)lu-* (CHD Š/1, 112-114, with question mark on the translation "apple"; Haas 2003: 267-269).

Secure attestations of sesame are rare in Hittite texts. It is written with the Sumerian writing ŠE.GIŠ.Ì (Hoffner 1974: 127) in association with the place-name Zallara, probably located in the region of (Rough) Cilicia. The translation "sesame" for Hitt. <sup>GIŠ</sup>*sam(m)am(m)a-* is mainly based on the observation that one can press oil from sesame, and its phonetic similarity to Akkadian *šamaššammū* ("sesame", lit. "oil-plant", cf. Reculeau 2009). However, the meaning "sesame" for <sup>GIŠ</sup>*sam(m)am(m)a-* is rejected by Hoffner (loc. cit.) and the CHD Š/1 114, which instead defines it a kind of "tree or its fruit; perhaps a nut". The <sup>GIŠ</sup>*sam(m)am(m)a-* occurs frequently in Hittite rituals, and must presumably be something that was easily available.

Of the remaining plants found in R62, cucumber has been thought, solely based on the similarly sounding Latin *cucumis* and related words in Greek, to be identified with Hittite *kunkuma-* / *kunkumati* (Haas 2003: 354-355). It occurs in rituals in combination with fruit, such as fig and apple, but the grounds for this identification are even less secure than in the other cases above. Black nightshade, which is common in PL90 and PL88, has not yet figured in discussions of Hittite or Akkadian plant names (but cf. Stadhouders 2011).

## **5. Evidence for wood exploitation**

### **5.1. Range of exploited taxa at Büklükale**

Charcoal was well preserved through the assemblage, with little vitrification or mineralisation observed, possibly due to its incorporation into the overall assemblage in a burnt state rather than unburnt. PL90, PL93 and PL94 contained moderate quantities of charcoal (0.3-0.5 g/L) with PL88 containing 2-3 times that concentration (Table 1A; Fig. 2). A total of 1,100 wood charcoal fragments were examined from the contexts in R62 yielding 16 taxa (see Table 3) identified mainly to the genus and family level, due to both the difficulty in reliably distinguishing species using wood anatomy alone and formation processes obscuring or modifying some diagnostic features. PL88 contains the least number of taxa (n=6) and is dominated by juniper while PL90 contains the most taxa (n=12) and is dominated by oak.

Juniper (*Juniperus* spp.) and deciduous oak (*Quercus* deciduous) are dominant, with oak abundance consistent across all four contexts (Table 3; Fig. 8) in contrast to juniper which varied from 14% to 57%. All other taxa comprised <20% of the sample counts, among them several species non-native to central Anatolia including olive (*Olea*), holly (*Ilex*) and pomegranate (*Punica*), only appearing in PL90, and hazelnut (*Corylus*) only present in PL88. Pine (*Pinus* spp.) and willow/poplar (*Salix/Populus*) were also major contributors at 10-20% and 5-17% of each context respectively (Table 3). The remaining charcoal assemblage is made up of several minor taxa mainly belonging to the rose family (Rosaceae) but also including dogwood (*Cornus*) and maple (*Acer* spp.).

Following Wright et al. (2015a), the identified taxa were organised into five analytical groups based on habitat and structure (Table 2; Fig. 8). Both oak and pine were kept separate due to their tendency to dominate their respective vegetation communities (Kaya and Raynal 2001; Woldring and Cappers 2001).

Aside from oak and pine, the three remaining units are: “Riparian” – containing hydrophilic taxa; “Minor” – containing open woodland and shrubby taxa usually found on the periphery of woodland zones or in the woodland understory; and “Exotic” – containing taxa not part of the native flora of central Anatolia and are likely to be imported to the area as wooden objects. When organised this way, PL93 and PL94 both appear very similar in their composition and all four contexts are similar in their abundance of pine and oak (Fig. 8). The biggest differences occur in PL88, where minor taxa dominate the assemblage, in this case juniper, which has an unusually high abundance, and in the presence of exotic woods in PL88 and PL90 (Fig. 8). PL88 also contains fewer riparian taxa (6.5%). PL88 also contained larger charcoal fragments than the other contexts (both juniper and oak) and contained the highest percentage of juniper, most of which appeared to be from larger tree components such as the trunk or mature branches, indicated by the dominance of fragments with flat ring curvature.

## 5.2. Textual references to tree species

Words for wood are common in both the Old Assyrian and Hittite texts, although it is not always easy to identify what types of wood are meant. We cannot be sure that the taxonomies we employ map directly on to ancient usage, or that ancient Hittite texts refer to the same taxa as identically named in texts from Mesopotamia.

In the Assyrian texts, wood appears as a commodity, either as relatively precious imports in small quantities (e.g. of cedar wood), or as firewood, often by the cartload, used for heating, cooking and in production (Barjamovic 2011; Ulshöfer 1995). In the Hittite texts, wood appears in economic, building and ritual contexts. Royal land-grants and laws show that fruit trees were cultivated in orchards (CHD Š/1, 112-114). A building ritual with Hattic background (CTH 414.1) informs us of the precautions taken to secure that the trees of the mountains acquiesce in being cut and used as building materials (Görke 2015b §§8-10).

Hittite <sup>GIŠ</sup>*sunila-* has been equated with pine (or fir) (Haas 2003: 286), denoting a wood used to make a small stand or offering table in a list of ritual equipment (CTH 323, VBoT 58 iv 18; Rieken et al. 2009 §13). A similarly written word is used to translate Akkadian *ašūḫ* ("fir/ pine of ...") in a trilingual tablet from Ugarit with Sumerian-Akkadian-Hittite versions of a Sumerian poem (Nougayrol 1968: 313, l. 38'; Laroche 1968: 774, l. 38).

If the oak is to be identified with the *eya*-tree, then it is well known from Hittite ritual texts and mythology, associated with the god Telipinu. One reason for identifying *eya-* with oak is the appearance of the hieroglyphic sign that represents Telipinu's name (Laroche 1960 no. 158) that looks somewhat like an oak tree (Haas 2003: 291-292). This is problematic, as the sign arguably looks more like yew, juniper or mature pine. Another proposal for oak is Hittite *allantaru*, attested only once, but allegedly related to Akkadian *allānu*, and literally being “*allān*-tree” (Hoffner 1974: 56). A number of other meanings including “maple” and “hazel” have been suggested for the Akkadian word *allānu* (Sturm 2008), but the later Assyrian term used for a particularly fine type of timber employed in the construction of the royal palaces was *allān Kaniš* – (Postgate and Powell 1992) – “the *allānu* of Kanesh”. This not only suggests that some type of oak was meant (hazel is not suitable for supporting beams), but it also links central Anatolia to a form of oak a millennium after the abandonment of Kanesh. Less secure is the connection of the better attested Hittite <sup>GIŠ</sup>*alanzan-* to this complex of words, which may be a maple or something unknown (Haas 2003: 292-293, for Akkadian maple see Nougayrol 1969: 396 fn. 21 and Astour 1980: 7).

The Hittite name of the poplar is possibly established through a multi-lingual word list that gives the Hittite *ḫarāu* as the equivalent of Sumerian *Á.SAL* = Akkadian *šarbatu* “Euphrates poplar” (KBo 1.42 ii 9). This

assumes that the Hittite scribes have correctly identified the Sumerian and Akkadian writings for a tree known from Mesopotamia with a native tree. Leaves of *harāu* are used in rituals for placing things on, and the wood is also employed to make pegs used in fixing rites where undesirable elements are nailed into the ground or onto the other side of a gate to prevent them from coming back to plague the ritual client (Haas 2003: 295).

Akkadian has two words for juniper: *du/aprānu*, allegedly corresponding to *Juniperus drupacea*, and *burāšu* (Sumerian <sup>GIŠ.SIM</sup>LI), allegedly corresponding to *Juniperus oxycedrus* (CAD D (1959) 190; see now Besnier et al. 2012; 2015). *J. drupacea* is not found in central Anatolia. An Akkadian medical text found at the Hittite capital, KUB 37.1 and probably written by a trainee physician, cf. Giusfredi 2012, refers to the wood and berries of both varieties, which is probably a reflection of the text's Mesopotamian roots. The medical applications of juniper are ethnographically well documented (Demirel and Çakılçoğlu 2017: 318), and *kikkiriānū* (juniper berries?) occur in an Old Assyrian list among items bought for a feast (Kt 88/k 71, cf. Dercksen 2008b: 98).

The most convincing proposal for the Hittite word for "juniper" is <sup>(GIŠ)</sup>*hu(wa)llissar*, which occurs in various ritual texts alongside cedar and other fumigants as a means of attracting a disappeared god, as well as being the substance out of which particular bowls used in rituals were made (Christiansen 2006: 86-89). As against these ritual uses, the juniper in R62 may have been used for construction, a function apparently not attested in Hittite texts for this word (HWb<sup>2</sup> H 810). A related word is preserved in multi-lingual word-lists from Boğazköy corresponding to Akkadian *burāšu* (HWb<sup>2</sup> H 807). <sup>(GIŠ)</sup>*hu(wa)llissar* may have been the word for scrubby types of juniper, as opposed to the Hittite word (*eya*-?) for the tall juniper (*Juniperus excelsior*) that was used for building. The Akkadian word *burāšu* in Mesopotamia, on the other hand, may not have distinguished the two types (CAD B 328).

The apple tree is associated with the sun-goddess of Arinna in a Hattic-Hittite bilingual myth (KUB 28.6, Haas 2003: 256), which seems to offer an aetiology for the origin of apples. However, the wood of apple itself does not seem to figure in rituals apart from a "fruit-bearing branch" that is laid on a plate in a purification ritual (KBo 34.92+ ii 13-15, Strauß 2006: 354-357).

Plum-trees: If the Sumerian <sup>GIŠ</sup>ŠENNUR can in fact be identified with the plum in Hittite texts (which is likely because it has a stone), then it was to be found alongside apples in an orchard or vineyard. This is stated in the Hittite Laws (§§104-105, Hoffner 1997: 100-102), as well as in a land-grant (CHD Š/1, 112; Rüter and Wilhelm 2012: 112). Pegs used in fixing rites are made of <sup>GIŠ</sup>ŠENNUR as part of a Luwian ritual against plague from Kizzuwatna (KUB 9.31 i 12, 14; Görke 2014 §§3, 4). Almond has been identified with the Hittite <sup>GIŠ</sup>*ēti*- (Haas 2003: 266) used in a ritual to appease the angered god Telipinu (CTH 324 below). However, if the identification is correct, it is more likely to be the nut than the wood of the tree that was used.

Olive wood, cedar and tamarisk are used for pegs as part of a fixing rite in a birth ritual (CTH 477, KUB 9.22 obv. ii 4-8, Mouton 2012 §11). In Assyrian texts, olive is related to two locations in particular, Hahhum on the Euphrates (Barjamovic 2011: 105) and Tuhpiya on the plateau (Barjamovic 2011: 310). The latter is particularly interesting in the present context, since Tuhpiya was probably located within a few days' travel from Büklükale.

Terebinth and/or pistachio occurs in textual references in relation to two localities in Anatolia dated to the Old Assyrian period. One is a reference in AKT 8, 146 to a "town of pistachios" (*āl buṭnātim*), whose Akkadian name Veenhof (2017) suggests may represent a translation of a local Anatolian toponym, or simply be a nickname linked to a prominent local feature. Based on the geography of the remaining places in the text, the town was located south of Hanaknak in the region of modern-day Zile (Barjamovic 2011).

The second reference comes from a letter sent to the Syrian city of Mari T.135 (Durand 2001) and refers to “Purušhaddum pistachios” (*buṭnātim Purušhaddētim*). Purušhaddum was a major political centre and commercial hub in central Anatolia during the first three centuries of the 2nd millennium B.C. (Barjamovic 2011).

## 6. Discussion

### *Formation processes and deposition*

Evidence from the plant remains and their context suggest that the archaeological remains were generated and introduced to R62 in a variety of ways. The assemblages were dominated by fruit and herb/spice seeds plus the probable remains of bread and fruit flesh. This points to the burning of food or food preparation debris rather than debris from the primary production of their ingredients via farming. Cereal components constitute a minor element of the assemblage, with weed seeds and straw more abundant, these finds being consistent with the cleaning of contaminants from crop products before consumption and the burning of straw from flooring or as a supplementary fuel. Much of the wood charcoal can be accounted for as fuel used in fires, but the exotic species may well have derived from wooden objects (bowls, boxes, stands, etc.) brought to the site and later burnt. Dung fuel is not considered a likely source for the remains, wood charcoals being abundant and weed seeds/chaff being a minor element of the assemblage. Patches of soot on the walls of R62 suggest that there was some *in situ* burning, perhaps generating wood concentrations as seen in PL88, but it is probable that most of the charred remains came from deposition of burnt debris into the shaft with the ceramics and ash.

This explanation fits well with the composition of the unremarkable charred assemblages from PL94 and PL93. These would not be out of place in domestic contexts in nearby contemporary settlement sites, such as Kaman-Kalehöyük and Kültepe (Fairbairn and Wright 2017; Fairbairn et al. in press). Similarly, the mineralised assemblages from these samples, dominated by foods, is explainable if R62 was being used as both a general rubbish dump and/or cesspit. The presence of numerous mineralised fruit, herb and spice seeds, is characteristic of latrine and cesspit fills in many ancient sites globally, incorporating taxa such as fig, raspberry/blackberry and grape that, while common in charred household rubbish deposits, are usually only found there in small quantities. The presence of dense concentrations of cups and rare artefacts in Phase 4 does lead one to question this interpretation, and it is also possible that mineralisation reflects the peculiar local chemical conditions of deposition.

PL90 and PL88 were quite different in nature, having an unusual archaeobotanical composition that is not normally recorded in sites of this period and dominated by burnt fruits, nuts, herbs/spices, cereal products/probable bread among dense assemblages of large charcoal fragments. The assemblages represent highly concentrated burning of specific products, including foods and, in the case of PL88, an unusual wood assemblage perhaps from ritual wooden items. The unusual preservation of the black, skeletonised grape seeds, with an enhanced organic content as shown in the EDS, is best explained as deriving from mineralisation after they had been partially burnt. The association of the plant remain assemblages with densely packed deposits containing numerous ceramic eating/drinking vessels suggest that they were burned and deposited together or in a closely related set of events.

### *Evidence for exchange and consumption*

The archaeobotanical assemblages from R62 at Büklükale preserve one of the richest assemblages of economic plant species to be recovered systematically by flotation from a single excavated feature in the

archaeological record of the west Asian Bronze Age. Several identified taxa have not previously been recorded at other archaeological sites in the Anatolian MBA – including dill, sesame, melon/cucumber and coriander – and elsewhere these are extremely uncommon, being found in high-status contexts including burials (Zohary et al. 2012). Others are rare finds in sites of this period, including sumac, nightshade, apple, almond, the wood and fruits/seeds of hazel and pomegranate and the wood of holly and olive. Beyond these rarities, several other food taxa are common finds for the period, but present at Büklükale in unusually large numbers (grape, bramble/raspberry, fig) alongside the fruits of wild trees that are infrequently encountered in post-Chalcolithic archaeobotanical assemblages (terebinth and hackberry). Most of the taxa found are unrecognized or attested poorly in the textual record of the Bronze Age, and the archaeological remains provide important new evidence to demonstrate their presence in Anatolia's economic system at that time.

On phytogeographical grounds, many of these species are probably imports to the region, being exotic to its flora and rarely seen in archaeological contexts. Pomegranate is found in several Anatolian Bronze Age trade contexts, along with fig, hazelnut and sumac at the MBA trade centre of Kültepe (Fairbairn and Wright 2017), with sesame at the LB port of Kinet Höyük (Çizer 2006), and with coriander in the cargo manifest of the Late Bronze Age Uluburun shipwreck (Ward 2003). Pomegranate had high symbolic and economic value in the ancient world (Immerwahr 1989, Ward 2003), and while relatively sparse in the archaeological record, the textual evidence presented here suggests that it was both available in Bronze Age Anatolia, and not particularly expensive, a single fruit costing little more than a loaf of bread.

The simplest explanation for the rare and exotic species is that they were obtained by trade or exchange, including via the well-known Assyrian traders, but also forms of gift exchange (e.g. Barjamovic 2011: 310) or provision by itinerant specialists (Batiuk 2013). The plant remains from R62 are associated with a rich material culture and can be seen as rarely preserved organic elements in a complex system of trade and exchange as part of Büklükale's participation in a larger regional exchange system.

While many plants in R62 were probably sourced by trade, several are cultivable in Anatolia today, and it is possible that some of the Büklükale remains derived from or included in early attempts at cultivation. Indeed, a trade in exotics has been identified as the way in which many plants were introduced to new cultivation regions (Boivin et al. 2012). The presence of pomegranate wood and fruits is consistent with its cultivation. Alternatively, the wood could have derived from utensils or craft items such as spoons, bowls or boxes, as is the case with holly, hazel, and olive, or even as ornamental elements in craft products due to its attractive grain appearance. The textual evidence summarised above also suggests wood could have been used in a variety of roles in ritual practice. While rare, these taxa are not unknown in other sites in central Anatolia, including holly in MBA strata on the mound of Kültepe (Fairbairn and Wright 2017), and holly, olive and fig at Late Iron Age Kaman-Kalehöyük (Wright et al. 2015a and b). Both the archaeological and textual evidence here strengthens the case for a Bronze Age exchange in some wood species, most likely as wooden objects and utensils.

Alongside the rarities are a range of common staple food and fuel species. Legumes were very sparse and, while small, the cereal assemblages showed a clear dominance of naked wheat and hulled barley, a pattern also seen at contemporary Kültepe (Fairbairn 2014), but not at contemporary Kaman-Kalehöyük, where glume wheat was more abundant in the MBA (Fairbairn et al. 2017). Such variation hints at distinctive patterns of crop selection between closely located sites in this period (Riehl 2014) and may well reflect different local production strategies or, in the case, social differences in crops consumed.

As with so many central Anatolian sites, the wood assemblage in R62 is predominately made up of taxa common in Bronze Age charcoal records where pine and oak both tend to dominate complemented by

members of the Rosaceae (rose) family. These includes almond, plum and the apple sub-family, and riparian taxa such as willow and ash. While none of these taxa are unusual, Detrended Correspondence Analysis (DCA) shows differences in Büklükale's assemblage both to nearby Kaman-Kalehöyük (Wright et al. 2015a, b) and to the more distant site of Kültepe (Fairbairn and Wright 2017), much of this caused by the higher abundance of juniper at Büklükale (Fig. 10). Much of the juniper in PL88 has very flat ring curvature and appears to be from large timbers, perhaps specially selected fuel, or even derived from re-used structural elements. Although juniper is recorded as a medicinal taxon in both (later) Assyrian and Hittite texts, the lack of juniper berries in the R62 strata points more to its presence being for either construction or fuel. Juniper is a good structural wood, being especially durable, and was often used preferentially for architectural purposes in large public buildings, for example in the city and palace walls at Kültepe (Manning et al. 2016; Wright personal observation 2017) and later at Gordion (Miller 2010: 33). Juniper is otherwise rare as a general fuel, perhaps in part because of its slow growth and environmental rarity compared to oak, pine and other taxa. Together these characteristics suggest that access to juniper for fuel or construction could have been controlled during the Bronze Age (and later, as at Gordion). The high abundance of juniper in R62 is thus unusual and suggests that it was either more available at Büklükale due to the local environment and/or social access, or that it was being specially selected for use in the events leading to deposition, perhaps due to its burning qualities or fragrance.

#### *Social, ceremonial and ritual consumption*

It is usually inadvisable to interpret a large underground chamber filled up with artefacts, charcoal and ash as anything other than a locus of waste disposal. But the nature of the archaeological deposits (see above) and the corresponding and unusual nature of the plant remains in R62 (and especially in PL90 and PL88) in this case suggests to us a different source for the deposits. The presence of so many burnt foods in the upper deposits, including probable remains of bread and fruit flesh, is wasteful from a subsistence/utilitarian viewpoint, and, in association with the artefact assemblage, opens the possibility of consumption during social events, potentially involving many people.

One possibility is that the food remains were the refuse of social gatherings after which the residue from cooking fires etc. were discarded into R62 alongside the cups and other serving paraphernalia as a commemoration of the event. Purposeful deposition of material in sub-surface features has been well studied in archaeology as a way in which events became physically commemorated and associated in a location as part of the creation of tradition (e.g. Whittle et al. 2000). Eating and is a common element of social events and the consumption of foods, including feasting, is well evidenced in a range of cultural settings as a core means by which participatory communities are formed to strengthen and define the social order (Kerner and Warmind 2015). Like in many other societies, commensality at Büklükale was likely a means by which social order was reproduced through the theatrics of controlled re-enactment which included the consumption of rare imported foods (Elias 1939; Geertz 1980).

The large number of drinking cups associated with the assemblage, and apparently deposited over a short time period, suggests that a significant part of the populace could participated in the event/events that led to the deposits in R62. At an average density of 200 people per hectare, the ca. 30-ha site would have had a population of around 6000, a figure corresponding roughly to comparable demographic data available for the region during this period (Barjamovic 2011: 373; 2014: 65-66). Many fragmented cups were found in the assemblages through the deposits, with 300 found in one deposit, suggesting that at least 5% of the putative inhabitants may have been involved in the episode that formed it. It is not possible to know who participated in such events, or how they were chosen for inclusion, but the deposits in R62 provide clear archaeological evidence for the type of large-scale commensal events that could have been an important

element in the broad integration of subjects in ancient states (Barjamovic 2004; von Dassow 2011; Fleming 2004; Seri 2005) in a context of transience and fragility in political integration and institutional agency (Yoffee 2005; Richardson 2012; Ando and Richardson eds. 2017).

While the plant remains could have simply been food in these gatherings, the textual record suggests that plants were also consumed in various ritual and medical contexts in Bronze Age Anatolia. One could assume that a ritual event taking place in connection with a large underground chamber in the foundations of a building would be connected to a foundation ritual. This is plausible given that the remains derive from R62's foundational levels and could relate to one of the rebuilding phases in that area of the site (Matsumura 2017). Several foundation rituals are recorded on tablets found at Hattusa, and some of them (e.g. CTH 414.1, mentioned above) include material that has a Hattic background, as do many of the older Hittite rituals, which show Hattic language elements and Hattic god-names dating from a time when Hattic, Hittite and Luwian languages were all used in central Anatolia (Goedegebuure 2008; Klinger 1996). However, these texts do not contain the ritual motifs that are of interest here. Instead, it is a later foundation ritual containing Mesopotamian and Hurrian elements (CTH 415) where cereals and fruits are filled into the foundations of a house during construction:

Afterwards they fill into all the foundations all the seeds of barley/grain, the seeds/berries of the fruit of the garden, the fine oil, the ghee, the (sesame) oil, the honey, the salt, the malt, the beer-bread, the silver, the gold, the (precious) stones and the *zapzaga-* (glass objects?) (KBo 15.24+ obv. ii 62-64; Torri 2011).

The other possibility, suggested by comparing ingredients in the ritual texts from Late Bronze Age Hattusa, is that the plant remains derived from a ritual to purify a house by contacting infernal deities (Collins 2003) or disposing of toxic ritual paraphernalia. This may have been performed at any time after the initial foundation in connection with a larger impurity, such as mass bloodshed or plague. However, until the context is investigated more thoroughly, this can only be one among several hypothetical possibilities. As shown in other regions where ritualised consumption of plant foods have been attested (Megaloudi 2005; Heiss 2014; Roviera and Chabal 2008) convincing identification of specific ritual associations can be difficult given the use of common foods and the vagaries of the archaeological record.

#### *Burnt offerings?*

One interesting feature of the R62 assemblage is the presence of grape seeds that were partially burnt before they were deposited into R62 as part of PL90. Burning, including the 'roasting' of plant foods, is a common form of ritual in later societies and was known in the second millennium, though burning fruits is decidedly rare in texts from Anatolia. One passage from a coronation ritual, which is aimed at attracting the chief gods of the pantheon to the ceremony, expressly contrasts fruits with the roasted material, although it seems that crushed fruits could also be roasted:

All the fruit, fresh and dried, each in small amounts, fig, raisin, olive, *paizzinna*-fruit, *warawara*-fruit, apple, quince/apricot<sup>2</sup>, *zupa*-fruit, *dammashuel*, pomegranate, grape, sesame .... Roasted material, each in small amounts, [...] *sanilis*, *ewan*-grain, broad beans, crushed *samama*, crushed fruits, crushed *kiškanû*-wood(/nuts?) [...] ... they fill up (KBo 10.34 i 15-18, 22-25).

This does not mean that cereals were always roasted, and that fruits were not, but fruits were generally displayed to attract a deity, or buried with other ingredients in the foundations of a building. An interesting exception is formed by the ritual of Bappi (CTH 431; Hutter 2013) made to appease Huwassana, the goddess of Hupisna/classical Kybistra in the modern-day region of Ereğli (Hutter 2004; Görke 2015a). Here,

the fragmentary paragraph previous to the mention of the ingredients articulates the wish that the anger of the deity be "burned away." It continues:

(§11) Afterwards, the oil, honey, fig and raisin are burned entirely. She speaks as follows: "As this fig holds 1000 seeds inside, as the raisin holds wine inside, so you, too, goddess my lady, hold the ritual client in favour. And as the oil and the honey are pleasing, so may the ritual client be pleasing to the goddess." (KUB 17.12 iii 6'-16'; Görke 2015a).

M. Hutter (2013) has emphasised a specifically Luwian identity for the goddess Huwassana and hypothesised that her rites did not form part of Hittite state cult. Whether or not such an ethnic delineation is possible or meaningful, it is true that analogous rites were carried out elsewhere without fruits necessarily being burned. Similar language is used in the ritual performed during the narrative of the myth of the disappearance of Telipinu (CTH 324), where it is the analogical magical power of the ingredients of the ritual that seems to be paramount in the attempt to pacify the god, who has withdrawn in anger (§19-22). Burning is mentioned in the ritual part of the Myth of Telipinu (§27), but it is unclear what the object is. The use of the ritual ingredients once again illustrates the manner in which their power was to be conceived:

§§19-22: Here lies *galaktar*-drug, [may his soul] be pacified, Here lies *parhuena*-grain, may his insides be mollified, here lies *samama*- may [his ...] be oiled, here lies a fig, just as the fig is sweet, so may Telipinu's [...] become sweet. Here lies a *leti* (a nut?), let it salve Telipinu's [...] (KUB 17.10 ii 12'-22'; Rieken et al. 2012).

A key theme of the Telipinu narrative is the return of the house as a physical entity to order after his departure, and the restoration of fertility and prosperity. Telipinu is also an encouraged guest at a ritual foundation ceremony with Hattic roots (CTH 414.1 §31), although without the use of fruits. The connection seems clear between offerings at a foundation ceremony and the guarantee of prosperity through the attraction of Telipinu to the proceedings whether to do with foundation or not.

Archaeological remains of burnt offerings have increasingly been identified in Classical period construction, burial and domestic contexts, where such activities were linked to pleasing the gods and plant sacrifice was often linked to ideas around good luck and fecundity (Hristova 2015; Matterné and Derreumaux 2008; Megaloudi 2005; Robinson 2002; Rovira and Chabal 2008). At Büklükale such an interpretation is plausible given the presence of so many burnt foods and the unusual preservation of grape seeds, although the deposits pre-date surviving texts relating to such practices in Anatolia by several centuries. While the practice of burning plant material and depositing it in pits is mainly attested in texts ascribed to an allegedly intrusive Hurrian cultic layer, this does not mean that such practices were necessarily imported into Anatolia in the mid-15<sup>th</sup> century B.C. (Campbell 2016). The view of a passive and ritually illiterate receiver culture being fed cultural material from more advanced neighbours is unlikely to be accurate or justifiable. Far more convincing is the view that the Hittite state sought actively to import and incorporate rituals and their associated mythologies corresponding to or complementing practices known already in central Anatolia, possibly such as might be attested at Büklükale. Ritual practices do not necessarily carry an ethnic stamp, and connections between similar ritual complexes in different areas may stretch back far into the distant past, or may simply have arisen independently from similar contexts.

## 7. Conclusion

The archaeobotanical assemblage from Büklükale R62 provides evidence for a distinctive, and archaeologically unique episode of plant consumption in the central Anatolian MBA. A mixture of everyday and rare, probably imported, food plants and wood was consumed and subsequently interred in a shaft-like

room. Archaeobotanical evidence provides important new and early records for the presence of several economic species in Anatolia and, when studied in archaeological context alongside textual evidence from the period, provides new insights into plant use and trade in the MBA that would not have been possible without this kind of cross-disciplinary collaboration. Furthermore, the evidence provides a significant new archaeological record for the important role that the consumption of plant foods played in the social gatherings that are increasingly seen to form an important point of social integration in early states.

Several possibilities exist to explain the range of activities that was undertaken in those gatherings, though a fuller understanding of them awaits the completion of faunal and artefact analysis (including trace-residue analysis). The evidence here pertains only to the use of plants and plant products. When considered in context, and alongside the second millennium textual record from Anatolia, there are plausible grounds for suggesting the R62 deposits saw ritualised consumption of plant foods as part of deposition in that structure, especially in Phase 3 of the sequence, perhaps linked to foundation ceremonies or other events in the life of the community or its people. Later Hittite ritual texts provide typological parallels, such as rituals to appease underworld deities or to attract disappeared gods in times of adversity, but as they post-date these deposits, such sources have to be used critically. Beyond providing evidence for the presence of plant consumption in Bronze Age social gatherings, this example demonstrates the potential of archaeobotany when coupled with detailed contextual information and textual research, to provide a critical basis for understanding rare occurrences of plant use and its significance in Bronze Age society, while also demonstrating the critical limits of such an approach.

### **Acknowledgements**

This paper is offered in honour of Naomi Miller, one of the most innovative and influential archaeobotanists of the Old World, whose wide ranging, cross-disciplinary studies, continue to provide the exemplar of research practice in understanding the complex history of ancient plant use. Research was supported by the Japanese Institute of Anatolian Archaeology and Australian Research Council grant FT130101702. Helmut Kroll, Ehud Weiss and Naomi Miller provided valuable discussion concerning the preservation of grape seeds and we thank two anonymous reviewers for their constructive comments. Marianne Tames-Demauros provided assistance with the wood charcoal analysis.

### **Bibliography**

Ando C, Richardson S (eds) (2017) *Ancient States and Infrastructural Power: Europe, Asia, and America: Empire and After*. University of Pennsylvania, Philadelphia

Astour MC (1980) North Syrian Toponyms Derived from Plant Names. In: Rendsburg GA et al (eds) *The Bible World. Essays in Honor of Cyrus H. Gordon*. Ktav, New York, pp 3-8

Barjamovic G (2004) Civic Institutions and Self-Government in Southern Mesopotamia in the Mid-First Millennium BC. In: Dercksen JG (ed) *Assyria and Beyond: Studies Presented to Mogens Trolle Larsen*. NINO, Leiden, pp 47-98

Barjamovic G (2010) Sites, Routes and Historical Geography in Central Anatolia. In: Singer I (ed) *Ipamati kistamati pari tumatimis. Luwian and Hittite Studies Presented to J. David Hawkins on the Occasion of his 70th Birthday*. Emery and Claire Yass Publications in Archaeology, Tel Aviv, pp 10-25

- Barjamovic G (2011) *A Historical Geography of Anatolia in the Old Assyrian Colony Period* (CNI 38). Museum Tusculanum, Copenhagen
- Barjamovic, G (2014) The Size of Kanesh and the Demography of Early Middle Bronze Age Anatolia. In: Atici L, Kulakoğlu F, Barjamovic G, Fairbairn A (eds) *Current Research in Kültepe/Kanesh. The American Schools of Oriental Research*, Bristol, pp 55-68
- Barjamovic G, Hertel TH & Larsen MT (2012) Ups and Downs at Kanesh – Observations on Chronology, History and Society in the Old Assyrian period. (OAAS 5, PIHANS 120). NINO, Leiden
- Bates DM, Robinson RW (1995) Cucumbers, melons and watermelons. In: Smartt J, Simmonds NW (eds) *Evolution of crop plants*, 2nd edn. Longman, Harlow, pp 89–96
- Besnier, M-F, Boutrolle, P, et al. (2012) On the Junipers of Ugarit, Part 1: The Word *Diprānu* and Its Wanderings. In Roche-Hawley, C., Hawley, R. (eds) *Scribes et érudites dans l'orbite de Babylone: Travaux réalisés dans le cadre du projet ANR Mespériph 2007-2011*. De Boccard, Paris, pp 201-260.
- Besnier, M-F, Boutrolle, P, Chanut, C, Hawley, R (2015) On the Junipers of Ugarit, Part 2: The word *diprānu* and the genus *Juniperus*. In Roche-Hawley, C., Hawley, R. (eds) *Devins et lettrés dans l'orbite de Babylone: Travaux réalisés dans le cadre du projet ANR Mespériph 2007-2011*. De Boccard, Paris, pp 81-156.
- Batiuk S (2013) The fruits of migration: Understanding the 'longue durée' and the socio-economic relations of the Early Transcaucasian Culture. *J Anth Arch* 32:449-477
- Boivin N, Fuller DQ, Crowther A (2012) Old World globalization and the Columbian exchange: comparison and contrast. *World Arch*, 44(3):452-469
- Campbell D (2016) The Introduction of Hurrian religion into the Hittite Empire. *Religion Compass* 10:295-306
- Charles M. (1993) Botanical remains. In: Green A (ed) *Abu Salabikh excavations Vol 4. The 6G Ash-tip and its contents*. British School of Archaeology in Iraq, London, pp 203-207
- Christiansen B (2006) *Die Ritualtradition der Ambazzi. Eine philologische Bearbeitung und entstehungsgeschichtliche Analyse der Ritualtexte CTH 391, CTH 429 und CTH 463*, (StBoT 48). Harrassowitz, Wiesbaden
- Çizer Ö (2006) *Archaeobotanical macro remains from Late Bronze Age Kinet Höyük and Tell Atchana (Alalakh) in southern Turkey: economical and environmental considerations*. Dissertation. Universität Tübingen.
- Collins BJ (2003) Purifying a House for the Infernal Deities (1.68), In: Hallo WW and Lawson Younger Jr. K (eds) *The Context of Scripture. Canonical Compositions from the Biblical World, Vol. I*. Brill, Leiden and Boston, pp 168-177
- Collins BJ (2014) Royal Co-option of a Popular Ritual: The Case of Hantitassu". In: Taracha P (ed) *Proceedings of the 8th International Congress of Hittitology, Warsaw, September 5–9, 2011*. Wydawnictwo Agade, Warsaw, pp 185-201
- Corti C (2017) The North: Hanhana, Hattena, Ištahara, Hakpiš, Nerik, Zalpuwa, Tummana, Pala and the Hulana River Land. In: Weeden M and Ullmann LZ (eds) *Hittite Landscape and Geography, HdO 1/121*. Brill, Leiden-Boston, pp 219-238
- Dalley S, Walker CBF, Hawkins JD (1976) *The Old Babylonian Tablets from Tell al Rimah*. British School of Archaeology in Iraq, London

- von Dassow EM (2011) Freedom in Ancient Near Eastern Societies. In: Radner K, Robson E, (eds) The Oxford Handbook of Cuneiform Culture. OUP, Oxford, pp 205-224
- Demirel S, Çakılçioğlu U (2017) Identification of Medical Plants in Hittite Cuneiform Scripts. *Belleten* 81(291):305-328
- Dercksen JG (2008a) Observations on Land Use and Agriculture in Kanesh. In: Michel C (ed.) Old Assyrian Studies in Memory of Paul Garelli (PIHANS CXII). Nederlands Instituut Voor Het Nabie, Oosten Leiden, pp 139-158
- Dercksen JG (2008b) Subsistence, Surplus and the Market for Grain and Meat at Ancient Kanesh. *Altorient Forsch* 35: 86–102
- Dietler, M (2011) Feasting and Fasting. In *The Oxford Handbook on the Archaeology of Ritual and Religion*, edited by T. Ingersoll, pp. 179-194. Oxford University Press.
- Dörfler W, Herking C, Neef R, Pasternak R, von den Driesch A (2011) Environment and Economy in Hittite Anatolia. In: Genz H, Mielke DP (eds) *Insights into Hittite History and Archaeology*. Peeters, Leuven, pp 99–124
- Durand M (2001) Une alliance matrimoniale entre un marchand assyrien de Kanesh et un marchand Mariote. In: van Soldt WH (ed) *Veenhof Anniversary Volume: Studies Presented to Klaas R. Veenhof on the Occasion of His Sixty-Fifth Birthday*. (PIHANS 89). Nederlands Instituut Voor Het Nabie, Oosten Leiden, pp 119-132
- Ertem H (1974) Boğazköy Metinlerine Göre Hititler Devri Anadolu'sunun Florası [The Flora of Anatolia in the Hittite Period, Based on Documents from Boğazköy]. *Türk Tarih Kurumu Basimevi*, Ankara
- Elias N (1939) *Über den Prozeß der Zivilisation*. Verlag Haus zum Falke, Basel
- Ezer S (2014) Kültepe-Kanesh in the Early Bronze Age. In: Atici L, Kulakoğlu F, Barjamovic G, Fairbairn A (eds) *Current Research in Kültepe/Kanesh*. ASOR, Bristol, pp 5-23
- Fairbairn A (in press) Agriculture in the Chalcolithic and Bronze Age of Asia Minor. In: Howe T, Hollander D (eds) *A Companion to Ancient Agriculture*. Wiley Blackwell, London
- Fairbairn A (2014) Archaeobotanical Investigations of Plant Consumption and Trade at Middle Bronze Age Kültepe/Kanesh. In: Atici L, Kulakoğlu F, Barjamovic G, Fairbairn A (eds) *Current Research in Kültepe/Kanesh*. The American Schools of Oriental Research, Bristol, 175-192
- Fairbairn A, Omura S (2005) Archaeological identification and significance of ÉSAG (agricultural storage pits) at Kaman-Kalehöyük, Central Anatolia. *Anatolian Archaeological Studies* 55:15-23
- Fairbairn AS, Wright NJ, Ustunkaya MC, Fenwick RSH (2017) Preliminary archaeobotanical results from Early Bronze Age III occupation at Kaman-Kalehöyük. *Anat Arch Stud* 20: 23-35
- Fairbairn AS, Wright NJ (2017) Grinding, burning and trading at Kültepe: Archaeobotanical evidence for economic differences between settlements in Anatolia's Middle Bronze Age. *Subartu* 39:9-27
- Fales M (2012) Sul ruolo delle sostanze alimentari nei testi medici mesopotamici. *Eothen* 20:233-254.
- Fleming D (2004) *Democracy's Ancient Ancestors: Mari and Early Collective Governance*. CUP, Cambridge
- Forlanini M (2008) The historical geography of Anatolia and the transition from the kârum-period to the Early Hittite Empire. In: Dercksen JG (ed) *Anatolia and the Jazira during the Old Assyrian Period* (OAAS 3. PIHANS 111). NINO, Leiden, pp 57-86

- Geertz C (1980) *Negara: The Theatre State in Nineteenth-Century Bali*. Princeton University Press, Princeton
- Giusfredi F (2012) The Akkadian Medical Text KUB 37.1. *Altorientalische Forschungen* 39(1):49-63.
- Goedegebuure P (2008) Central Anatolian Languages and Language Communities in the Colony Period: A Luwian-Symbiosis and the Independent Hittites. In: Dercksen JG (ed.) *Anatolia and the Jazira during the Old Assyrian Period* (OAAS 3. PIHANS 111). NINO, Leiden, pp 137-180
- Görke S (2014) Das Ritual des Zarpiya aus Kizzuwatna (CTH 757), [hethiter.net/](http://www.hethport.uni-wuerzburg.de/txhet_besrit/partitur.php?xst=CTH%20757&prgr=&lg=DE&ed=S.%20G%20Görke): CTH 757 (TX 05.06.2014, TRde 05.06.2014). [http://www.hethport.uni-wuerzburg.de/txhet\\_besrit/partitur.php?xst=CTH%20757&prgr=&lg=DE&ed=S.%20G%20Görke](http://www.hethport.uni-wuerzburg.de/txhet_besrit/partitur.php?xst=CTH%20757&prgr=&lg=DE&ed=S.%20G%20Görke). Accessed February 2018
- Görke S (2015a) Das Ritual der Bappi (CTH 431), [hethiter.net/](http://www.hethport.uni-wuerzburg.de/txhet_besrit/partitur.php?xst=CTH%20431&prgr=&lg=DE&ed=S.%20Görke): CTH 431 (TX 08.06.2015, TRde 09.06.2015). [http://www.hethport.uni-wuerzburg.de/txhet\\_besrit/partitur.php?xst=CTH%20431&prgr=&lg=DE&ed=S.%20Görke](http://www.hethport.uni-wuerzburg.de/txhet_besrit/partitur.php?xst=CTH%20431&prgr=&lg=DE&ed=S.%20Görke). Accessed February 2018
- Görke S (2015b) Ein Palastbauritual (CTH 414.1), [hethiter.net/](http://www.hethport.uni-wuerzburg.de/txhet_besrit/partitur.php?xst=CTH%20414.1&prgr=&lg=DE&ed=S.%20Görke): CTH 414.1 (TX 11.06.2015, TRde 13.03.2015). [http://www.hethport.uni-wuerzburg.de/txhet\\_besrit/partitur.php?xst=CTH%20414.1&prgr=&lg=DE&ed=S.%20Görke](http://www.hethport.uni-wuerzburg.de/txhet_besrit/partitur.php?xst=CTH%20414.1&prgr=&lg=DE&ed=S.%20Görke). Accessed February 2018
- Haas V (2003) *Materia Magica et Medica Hethitica. Ein Beitrag zur Heilkunde im Alten Orient*. De Gruyter, Berlin-New York.
- Heiss AG, (2009) Anatomy of European and North American woods - An interactive identification key. <http://www.holzanatomie.at/>. Accessed June 2016
- Heiss AG (2014) Ceremonial foodstuffs from prehistoric burnt offering places in the Alpine Region. In Chevalier A, Marinova E, Peña-Chacarro L (eds) *Plants and People: Choices and Diversity through time*. Oxford, Oxbow, pp 344-384
- Heiss A, Antolin F, Bleicher N, et al (2017) State of the (t)art. Analytical approaches in the investigation of components and production traits of archaeological bread-like objects, applied to two finds from the Neolithic lakeshore settlement Parkhaus Opéra (Zürich, Switzerland). *PLoS One* 12:e0182401
- Hoffner HA (1967) An English-Hittite Glossary. *Revue Hittite et Asiatique* 25(80):6-99
- Hoffner HA (1974) *Alimenta Hethaeorum. Food Production in Hittite Asia Minor* (AOS 55). American Oriental Society, New Haven
- Hoffner HA (1997) *The Laws of the Hittites. A Critical Edition*. Brill, Leiden
- Hristova I (2015) The use of plants in ritual context during Antiquity in Bulgaria: overview of the archaeobotanical evidence. *Bulgarian e-Journal of Archaeology* 5: 117-135
- Hutter M (2004) Der Gott Tunapi und das Ritual der fBappi im Һuwaššanna-Kult. In: Hutter M, Hutter-Braunsar S (eds) *Offizielle Religion, lokale Kulte und individuelle Religiosität. Akten des religionsgeschichtlichen Symposiums „Kleinasiens und angrenzende Gebiete vom Beginn des 2. bis zur Mitte des 1. Jahrhunderts v. Chr.“* Münster, pp 249-257
- Hutter M (2013) The Luwian Cult of the Goddess Huwassanna vs. Her Position in the 'Hittite State Cult. In: Mouton A, Rutherford I, Yakubovich I (eds) *Luwian Identities – Culture, Language and Religion Between Anatolia and the Aegean*. Brill, Leiden-Boston, pp 177-190
- Immerwahr SA (1989) The pomegranate vase: its origins and continuity. *Hesperia* 58:397-410
- Kaya Z, Raynal DJ (2001) Biodiversity and conservation of Turkish forests. *Biological Conservation* 97:131–141

- Kerner C, Warmind M (eds) (2015) *Commensality. From Everyday Food to Feast*. Bloomsbury, London
- Klinger J (1996) *Untersuchungen zur Rekonstruktion der hattischen Kultschicht, (StBoT 37)*. Harrassowitz, Wiesbaden
- Kroll H (1999) Vor- und frühgeschichtliche Weinreben – wild oder angebaut? *Trierer Zeitschrift* 62:151-3
- Laroche E (1960) *Les Hiéroglyphes Hittites. Première Partie: L' Écriture*. Éditions du Centre National de la Recherche Scientifique, Paris.
- Laroche E (1968) *Textes de Ras Shamra en Langue Hittite*. In: Nougayrol J., Laroche E., Virolleaud Ch., Schaeffer Cl. F.-A. *Ugaritica V. Nouveaux textes accadiens, hourrites et ugaritiques des archives et bibliothèques privées d'Ugarit; commentaires des textes historiques (première partie)*. Mission de Ras Shamra, Paris, pp. 769-784.
- Laroche E (1978-1979) *Glossaire de la langue hourrite, 1: A-L; 2: M-Z, Index, (RHA 34-35)*. Klincksieck, Paris
- Larsen MT (2015) *Ancient Kanesh: A Merchant Colony in Bronze Age Anatolia*. Cambridge University Press, Cambridge
- Manning SW, Griggs CB, Lorentzen B et al (2016) Integrated Tree-Ring-Radiocarbon High-Resolution Timeframe to Resolve Earlier Second Millennium BCE Mesopotamian Chronology. *PLOS ONE* 11(7): e0157144.
- Matsumura K (2015) *Büklükale kazısı 2013. Kazı Sonuçları Toplantısı* 36 (3): 671-684.
- Matsumura K (2017) The ancient city connecting East and West: Büklükale. In: Alparslan M (ed) *Places and spaces in Hittite Anatolia I: Hatti and the East*. *Türk Eskiçağ Bilimleri Enstitüsü, İstanbul*, pp 63-74
- Matsumura K (2018) The Glass Bottle and Pendant from Büklükale and Their Dating. In: Henderson J and K Matsumura (eds) *Anatolian Archaeological Studies 21. Aspects of Late Bronze Age glass in the Mediterranean*. MECCJ, Tokyo, pp 11-29
- Megaloudi, F. (2005). *Burnt sacrificial plant offerings in Hellenistic times: an archaeobotanical case study from Messene, Peloponnese, Greece*. *Veg Hist Archaeobot* 14: 329-340.
- Matterne V, Derreumaux M (2008) A Franco-Italian investigation of funerary rituals in the Roman world, 'les rites et la mort a Pompei' the plant part: a preliminary report. *Veg Hist Archaeobot* 17: 105–12
- Miller JL (2004) *Studies in the Origins, Development and Interpretation of the Kizzuwatna Rituals, (StBoT 46)*. Harrassowitz, Wiesbaden
- Miller NF (2010) *Botanical Aspects of Environment and Economy at Gordion, Turkey*. University of Pennsylvania Press, Philadelphia
- Mouton A (2012) *Rituel de naissance du Kizzuwatna*. <http://www.hethiter.net>. Accessed February 2018
- Nesbitt, M. (1995) *Plants and People in Ancient Anatolia*. *The Biblical Archaeologist* 48/2:68-81
- Newbury DE (1998) Standardless quantitative electron-excited X-ray microanalysis by energy-dispersive spectrometry: what is its proper role? *Microscopy and Microanalysis* 4(6): 585-597
- Nougayrol J (1968) 169 - Signalement Lyrique (R. S. 25.421). In: Nougayrol J., Laroche E., Virolleaud Ch., Schaeffer Cl. F.-A. *Ugaritica V. Nouveaux textes accadiens, hourrites et ugaritiques des archives et bibliothèques privées d'Ugarit; commentaires des textes historiques (première partie)*. Mission de Ras Shamra, Paris, pp. 310-319.

- Nougayrol J (1969) La Lamaštu à Ugarit. *Ugaritica* 6:393–408
- Paris HS (2016) Overview of the origins and history of the five major cucurbit crops: issues for ancient DNA analysis of archaeological specimens. *Veg Hist Archaeobot* 25(4): 405-414
- Postgate, N. and Powell, M., 1992. Trees and timber in Mesopotamia. *Bull. Sumerian Agric* 6:1-31
- Reculeau H (2009) La pointe sur la "plante à huile": réflexions sur la culture du sésame en Syrie-Mésopotamie à l'âge du Bronze. *Journal des Médecine Cunéiformes* 13: 13-37
- Richardson S (2012) Early Mesopotamia: The Presumptive State. *Past and Present* 215: 3-49
- Riehl S (2014) Changes in crop production in Anatolia from the Neolithic period until the end of the early Bronze Age. In: Wawruschka C (ed) *Prehistoric Economies of Anatolia: Subsistence Strategies and Exchange*. Verlag Marie Leidorf GmbH, Rahden, pp 59-71
- Rieken E, Lorenz J, Bauer A et al (2012) CTH 324.1 - Erste Version des Telipinu-Mythos, [http://www.hethport.uni-wuerzburg.de/txhet\\_myth/partitur.php?xst=CTH%20324.1&prgr=&lg=DE&ed=E.%20Rieken%20et%20al](http://www.hethport.uni-wuerzburg.de/txhet_myth/partitur.php?xst=CTH%20324.1&prgr=&lg=DE&ed=E.%20Rieken%20et%20al). Accessed February 2018
- Robinson M (2002) Domestic burnt offerings and sacrifices at Roman and pre-Roman Pompeii, Italy. *Veg Hist Archaeobot* 11:93-100.
- Rovira N, Chabal L (2008) A foundation offering at the Roman port of Lattara (Lattes, France): the plant remains. *Veg Hist Archaeobot* 17:S191–S200
- Rüster C, Wilhelm G, 2012 *Landschenkungsurkunden hethitischer Könige*, StBoT Beiheft 4, Harrassowitz, Wiesbaden.
- Sagona A, Zimansky, P (2009) *Ancient Turkey*. Routledge, Cambridge-New York
- Schweingruber FH, Börner A, Schulze AD (2006) *Atlas of Woody Plant Stems: Evolution, Structure, and Environmental Modifications*. Springer-Verlag, Berlin
- Scurlock (2008) Review of Renal and Rectal Disease Texts. By Markham J. Geller. *Die babylonisch-assyrische Medizin in Texten und Untersuchungen, Journal of the American Oriental Society* 128.2:354-356.
- Seri A (2005) *Local Power in Old Babylonian Mesopotamia*. Equinox, Sheffield
- Stadhouders, H.A.I. (2011) The Pharmacopoeial Handbook Šammu šikinšu - An Edition. *Journal des médecines cunéiformes*, volume 18:1-55.
- Stivala G (2004) Contributo alla lessicologia ittita: per una classificazione dei nomi di piante erbacee. *Studi epigrafici e linguistici sul Vicino Oriente antico* 21:35-64
- Strauß R (2006) *Reinigungsrituale aus Kizzuwatna. Ein Beitrag zur Erforschung hethitischer Ritualtradition und Kulturgeschichte*. Brill, Berlin-New York
- Sturm T (2008) Allanū-Haselnüsse als Delikatesse im karam-zeitlichen Handel von Anatolien nach Nordmesopotamien (ca. 1930–1730 v. Chr.). *Altorient Forsch* 35:296–311
- Süel A, Soysal O (2003) A Practical Vocabulary from Ortaköy. In: Beckman GM, Beal RH, McMahon G (eds) *Hittite Studies in Honor of Harry A. Hoffner Jr. on the Occasion of His 65th Birthday*. Eisenbrauns, Winona

Lake, pp 349-365

Torri G (2011) Rituale di costruzione di un tempio (CTH 415), hethiter.net/: CTH 415 (TX 25.07.2012, TRit 02.02.2011) [http://www.hethport.uni-wuerzburg.de/txhet\\_besrit/partitur.php?xst=CTH%20415&prgr=&lg=IT&ed=G.%20Torri](http://www.hethport.uni-wuerzburg.de/txhet_besrit/partitur.php?xst=CTH%20415&prgr=&lg=IT&ed=G.%20Torri) Accessed February 2018

Ulshöfer AM (1995) Die altassyrische Privaturkunden. Franz Steiner, Stuttgart

Veenhof KR (2010) Ancient Assur: the city, its traders, and its commercial network. *J Econ Social Hist Orient* 53:39–82

Veenhof KR (2017) Kültepe Tabletleri VIII. The Archive of Elamma, son of Iddin-Suen, and his Family (Kt. 91/k 285-568 and Kt. 92/k 94-187). *Türk Tarih Kurumu Yayınlarından 6/X. Ankara Kültepe Tabletleri 8. Türk Tarih Kurumu Yayınları, Ankara*

Ward C (2003) Pomegranates in eastern Mediterranean contexts during the Late Bronze Age. *World Arch* 34:529-541

Weeden M (2013) A Hittite Tablet from Büklükale. *Anat Arch Stud* 18:19-35

Wengrow D (2010) *What Makes Civilization? The Ancient Near East and the Future of the West*. Oxford University Press, Oxford

Whittle A, Davies JJ, Dennis I et al (2000). Neolithic activity and occupation outside Windmill Hill causewayed enclosure, Wiltshire. *Wilt Arch & Nat Hist Mag* 93:131-180

Woldring H, Cappers, R (2001) The Origin of the Wild Orchards of Central Anatolia. *Turk J Bot* 25:1–9

Wright NJ, Fairbairn AS, Faith JT, Matsumura K (2015a) Woodland modification in Bronze and Iron age central Anatolia: An anthracological signature for the Hittite state? *J Arch Sci* 55:219–230

Wright NJ, Fairbairn AS, Üstünkaya MC, Faith JT (2015b) Explaining changing patterns of wood presence across the Bronze and Iron Age at Kaman-Kalehöyük, central Anatolia. *Quat Int* 431a:90-102

Yakar J (2011) Anatolian chronology and terminology. In: Steadman S, McMahon G (eds) *The Oxford Handbook of Ancient Anatolia*. Oxford University Press, Oxford, pp 56-93

Yoffee N (2005) *Myths of the Archaic State: Evolution of the Earliest Cities, States, and Civilizations*. Cambridge University Press, Cambridge

Zohary D, Hopf M, Weiss E, (2012) *Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin*. Oxford University Press, Oxford

## Figure and Table captions

### Table 1

Summary seed and composition data from Büklükale R62 samples

### Table 2

EDS data from Büklükale samples. Quantity of elements expressed following Newbury 1998 (Major = >10 wt%; Minor = 1-10 wt%; Trace <1 wt%) with weight % in brackets. Figures calculated as mean values  $\pm$  standard deviation. N = number of assays on each tissue

### Table 3

Wood charcoals identified from Büklükale R62 (*Af* = abundance count; *%f* = percentage frequency)

### Fig. 1

Büklükale location and relevant features: a. Location and sites mentioned in text; b. Aerial photograph showing site location (in red circle) and location of R62 (starred) (K. Matsumura); c. plan of building foundations with R62 and external wall shown (grid 10m squares; K. Matsumura)

### Fig. 2

Details of R62 features: a. Section drawing showing Provisional Layers (PL) and phases (elevation in metres); b. photo of PL90 (left) at the end of excavation (K. Matsumura)

### Fig. 3

Büklükale R62 charcoal concentration and proportion of mineralised and charred seeds (sum shown on chart)

### Fig. 4

Büklükale R62 composition of charred assemblages for each context

Fig. 5. Büklükale R62 composition of mineralised assemblages by context

### Fig. 6

Büklükale R62 preservation classes of grape seeds by context (sum shown on chart)

Fig. 7

Plant remains from Büklükale: a. Grape (*Vitis vinifera*) seed from PL88 showing charred (upper) and mineralised (lower) preservation; b. charred dill (*Anethum graveolens*) seed; c. cereal product, probably bread, with detail of pericarp longitudinal cells; d. cereal food product, probably bread, showing fragment of epidermis; e. probable bread showing air cavities (x); f. mineralised pomegranate (*Punica granatum*) seeds (full seed on right; other three seeds having lost testa); g. mineralised sesame (*Sesamum indicum*) seeds from PL94; h. detail of sesame seed surface showing rounded cells; i. mineralised broad *Cucumis* (melon/cucumber) seed (all images Andrew Fairbairn)

Fig. 8

Charcoal abundance by ecological grouping from contexts at Büklükale R62

Fig. 9

EDS spectra from grape seeds at Büklükale (y axis in keV): a. brown mineralised seed from PL94; b. black mineralised seed from PL90 (outer surface of embryo)

Fig. 10

Detrended correspondence analysis of wood data from Kaman-Kalehöyük and Kültepe