ARCHAEOBOTANICAL INVESTIGATIONS AT TELL EL-RETABA. 2ND INTERMEDIATE PERIOD – 18TH DYNASTY CEMETERY AND SETTLEMENTS[1]

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Abstract: *This article presents results of analysis of 2nd Intermediate period and 18th dynasty archaeobotanical remains from the multi-period settlement and cemetery site of Tell el-Retaba in the Wadi Tumilat; material from the Ramesside and 3rd Intermediate period can be found in A&L 25 (2015, 175–200). Excavations conducted since 2009 have yielded abundant charred plant macro-remains the analyses of which have enabled hypotheses relating to the local environment, animal husbandry, agriculture and subsistence strategies. It has now been established that the area experienced regular fluctuations of water levels and changing water-bodies, and that the inhabitants of the settlements of all periods at the site generally seem to have relied primarily upon an integrated arable and livestock agricultural system.*

Keywords: *Tell el-Retaba, Archaeobotany, Wadi Tumilat, Settlement Archaeology*

Introduction

This article is a continuation of the results of archaeobotanical analyses presented in *E&L XXV,*[2] from the Ramesside and 3rd Intermediate period remains at Tell el-Retaba. See that article for a general introduction to the site. The focus here is the earlier 2nd Intermediate period – 18th dynasty.

Structures and remains dating to the period in question have been found in several excavation areas at Tell el-Retaba.[3] See figs. 1, 2 & 3, and see table 1 for phasing. Both cemetery and fragmentary settlement remains of the 2nd Intermediate period have been found. The tombs are well dated and are close parallels of the better-known Hyksos burials found at Tell el-Dab'a. The settlement remains are sparse, but the stratigraphy places them at an earlier date than the cemetery.[4] The existence of an 18th dynasty settlement at the site was suspected since the outset of work at the site by the current mission, as Petrie reported discovering a large house of this date at Tell el-Retaba in 1906. The presence of this settlement was confirmed in 2009.[5] The settlement remains are fragmentary, but thus far both domestic and 'industrial' buildings have been found – huts, silos, and the so-called 'black houses'. A significant area of more intact remains was uncovered during the final phase of the rescue excavations conducted by Mustafa Nour el-Din in advance of the road expansion works across the site.[6] Finds from within the 18th dynasty buildings are typical of domestic households – sickles, querns grinders etc.

Since 2009, 36 samples from stratigraphic units dated to 2nd Intermediate period – 18th dynasty primarily from excavation areas 4 & 7 (see figs. 1, 2 & 3) (phases F & G, see table 1) have been recovered for archaeobotanical analysis from the excavations at Tell el-Retaba.[7] As is the case at many ancient Egyptian settlement sites the charred plant macrofossils primarily represent crop/food processing waste used as fuel and fodder, preserved by burning.[8]

[1] The mission is working under the auspices of the Polish Centre of Mediterranean Archaeology, University of Warsaw; involved are also: Institute of Archaeology, University of Warsaw; Slovak Academy of Sciences; Aigyptos Foundation, Bratislava. The works have been also supported by the Polish National Science Centre (grant 2012/05/B/HS3/03748) and by the Slovak Research and Development Agency (grant APVV-5970/12).

[2] Malleson 2015, 175–200

[3] Rzepka *et al.* 2011; 2013; 2014; 2015

[4] Rzepka *et al*. 2014, 56

[5] Rzepka *el al*. 2011, 156–158

[6] Rzepka *et al*. 2013

[7] See Malleson 2012a; 2012b; 2013; 2014; 2015 for preliminary reports from seasons 2009–2011 and the 19th dynasty – 3rd Intermediate Period materials.

[8] Clapham and Stevens 2012; Malleson in preparation; Moens and Wetterstrom 1988; Murray 2000 ; 2009; Stevens and Clapham 2014; Van der Veen 1999

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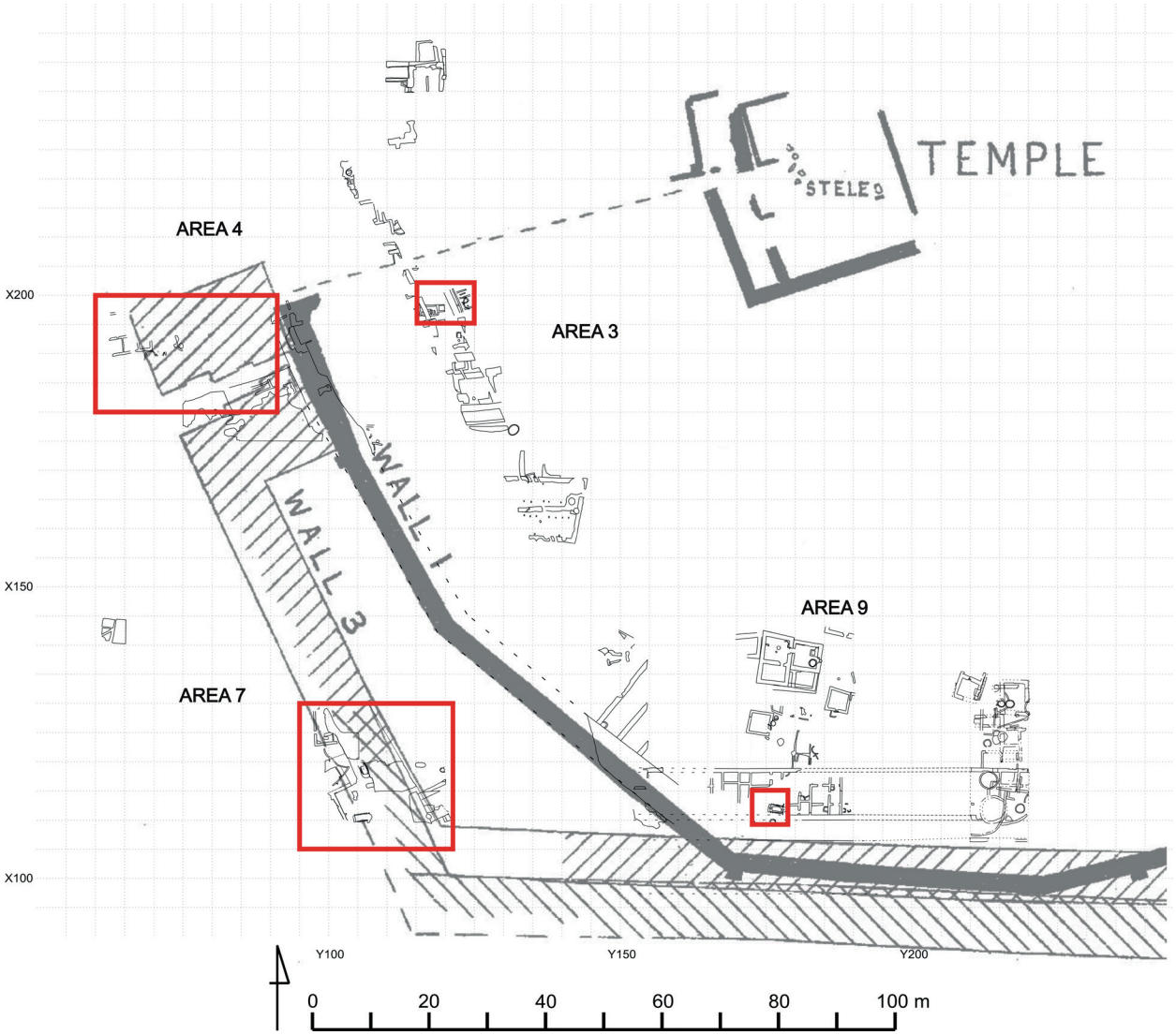

Fig. 1 General plan of the western part of the site with location of areas in which deposits from SIP and 18th Dynasty were explored by the Polish-Slovak Mission marked in red (drawing Ł. Jarmużek)

Table 1 Phasing information for Second Intermediate Period – 18th Dynasty remains at Tell el-Retaba

Phase	Dating	Main features
G3	Second Intermediate Period (SIP)	Settlement and cemetery
G2	SIP	Settlement and cemetery
G1	SIP	Transition (?) between the SIP settlement and a settlement of the early 18th dynasty
F4	18th Dynasty	Open (?) settlement of the early 18th dynasty – semi-permanent structures built of greenish mudbricks
F3	18th Dynasty	Open (?) settlement of the "Black houses"
F2	18th Dynasty	Scattered post-"Black House" settlement layers dating to the reign of Thutmose III/Amenhotep II
F1	18th Dynasty	Hiatus (?) in the 2nd half of 18th Dynasty

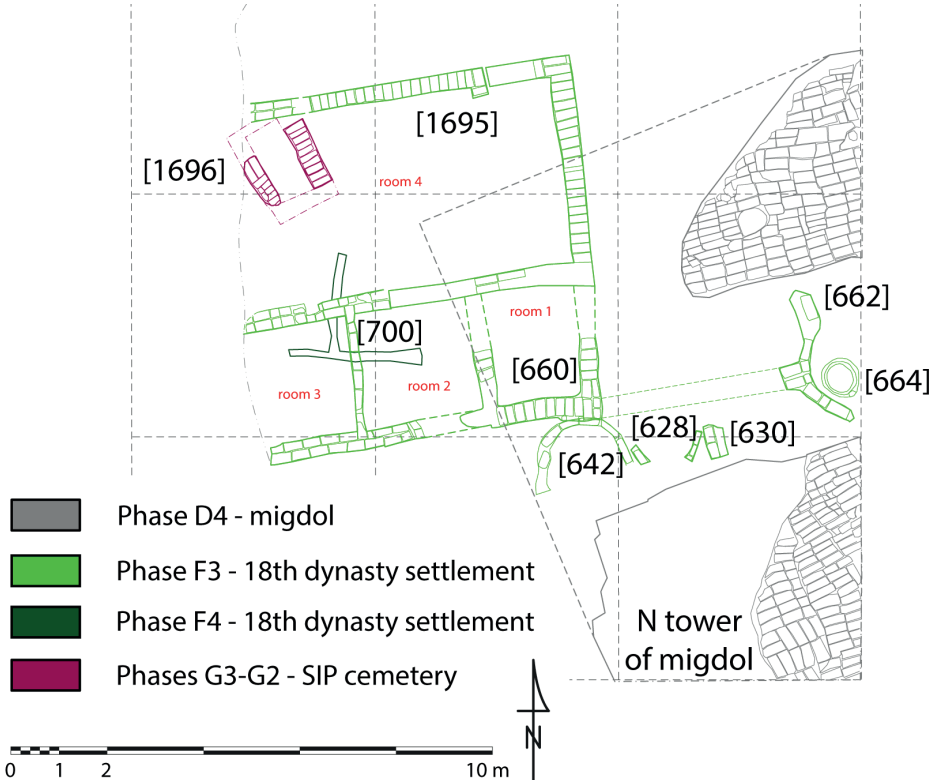

Fig. 2 Area 4 – plan (drawing L. Hulková, E. Stopková)

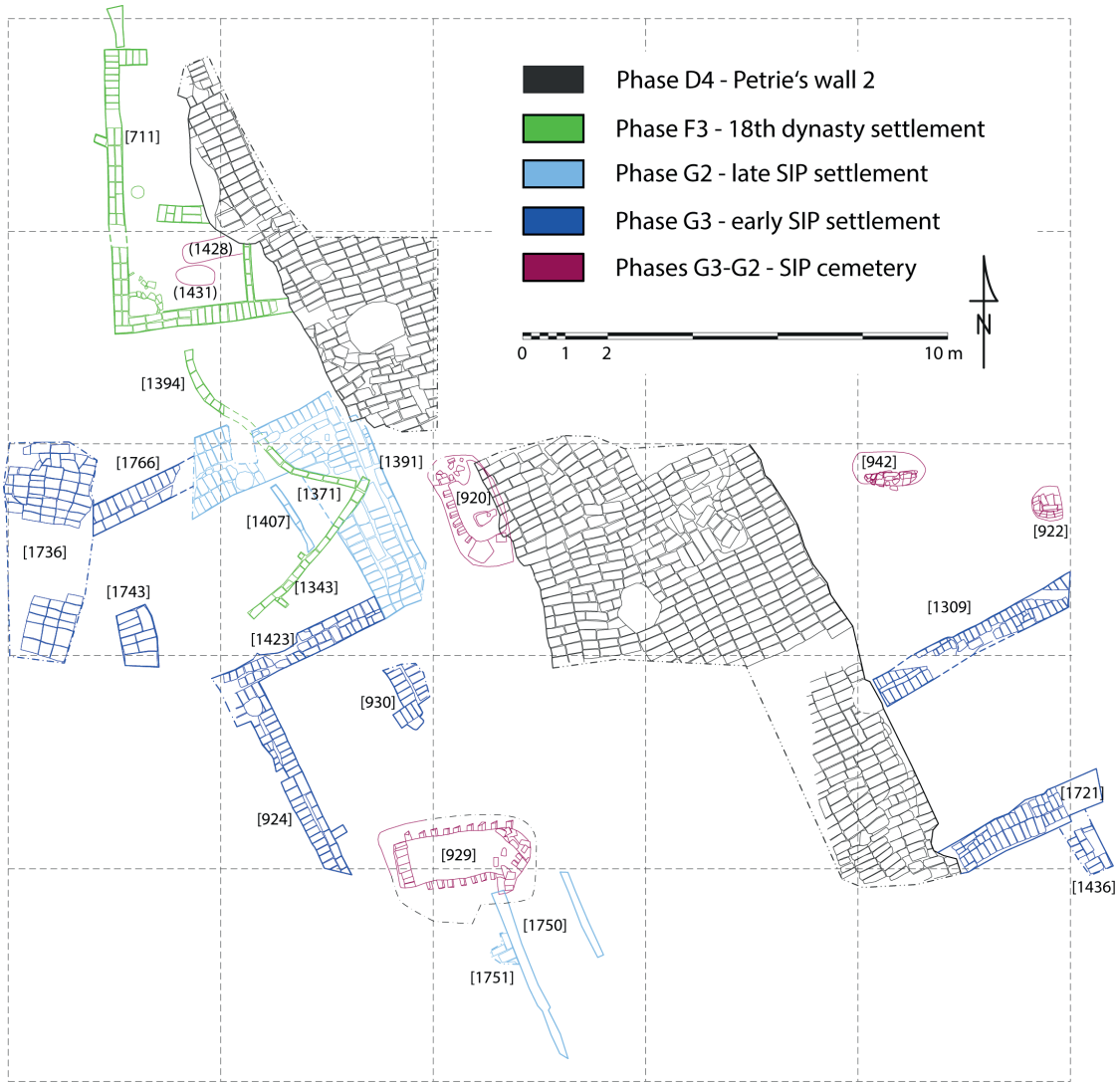

Fig. 3 Area 7 – plan (drawing L. Hulková, E. Stopková)

Methods

During excavations at Tell el-Retaba samples are taken for archaeobotanical analyses based on judgements of the excavators. All samples are processed using the bucket flotation method (300 µm mesh) and then air dried. The flots are then dry sieved through a 500 µm, 300 µm stack to facilitate sorting. The macrofossils are sorted in the workroom during the field season under a BMZ zoom stereo microscope at × 6–30 magnification. Time restrictions have led to adaptations of the sample sorting strategy. In 2011 the decision was taken to sort and identify just 10% of the <500 µm part of the sample due to the abundance of a few types of small sized plant items. In 2014 it was decided that for larger samples (in order to have time to study at least a part of each sample) a sub-sample of 25–50% of the flot would be studied. Where the flot was sub-sampled, the record of sample volume was adjusted in the database to reflect this.

Results

A total of 36,724 individual items have been identified from these excavations (18th dynasty – 2nd Intermediate period units) with an average of 229 items per litre. Table 2 gives basic raw data of item counts, soil sample size, and density of plant remains (items per litre of soil sampled / IPL) for each unit.

Due to the rather fragmentary nature of many of the buildings from these phases, the materials are assessed here based on their context type and phase rather than by building / room and phase as was the case for the later remains.[9] From an archaeobotanical point of view, archaeological features represent either primary deposits that derive from stores of foods (either desiccated, or accidentally/deliberately burned *in situ*), secondary deposits such as *in situ* ashes in hearths/ovens/kilns or other heating installations, or tertiary deposits that represent the disposal of plant remains/ash in dumps or middens, and the general 'background noise' of windblown, scattered and trampled ashes and plant debris which spread throughout settlements.[10] The assemblage in Tell el-Retaba consists of plant remains from secondary and tertiary features (with the one notable exception of a jar of

Table 2 Table of samples from 2nd Intermediate period – 18th dynasty

Phase	Strat. Unit	Unit type	Total item count	Total sample volume (litres)	Density (IPL)
G3	1311	Dump - ashy	980	5	196
G3	1315	Floor	2008	2	1004
G3	1405	Dump - ashy	457	5	91.4
G2	907	Cut	113	5	22.6
G2	917	Dump - sandy	505	5	101
G2	922	Tomb	28	1	28
G2	927	Dump - tomb	735	5	147
G1	799	Dump - tomb	234	5	46.8
G1	802	Dump - tomb	49	5	9.8
G1	810	Dump - tomb	78	5	15.6
G1	812	Dump - tomb	1299	5	259.8
F4	529	Dump	1175	5	235
F4	532	Dump / silo collapse	304	5	60.8
F4	534	Natural	7	5	1.4
F4	707	Dump - sandy	324	7	46.29
F3	383	Dump - ashy	781	5	156.2
F3	632	Dump - sandy	721	5	144.2
F3	633	Fireplace / dump?	426	5	85.2
F3	634	Dump	479	5	95.8
F3	669	Oven	2155	2	1077.5
F3	689	Dump - sandy	211	2	105.5
F3	697	Dump - ashy	2411	5	482.2
F3	706	Dump - sandy	397	13.5	29.41
F3	710	Oven	4264	3	1421.33
F3	897	Dump - ashy	1524	5	304.8
F3	1353	Dump - ashy	1167	5	233.4
F3	1394	Wall	222	1.25	177.6
F3	1406	Dump - ashy	2952	1.25	2361.6
F2	375	Dump	470	3	156.67
F2	512	Dump - sandy	272	5	54.4
F2	515	Dump	548	5	109.6
F2	516	Dump?	869	5	173.8
F2	1338	Dump - sandy	909	2.5	363.6
F2	1345	Dump - ashy	2663	2.5	1065.2
F2	1348	Fireplace	4947	4	1236.75
F2-C	1332	Floor? - sandy	40	5	8
TOTALS			36724	160.25	229.17

[9] Malleson 2015

[10] Fuller and Stevens 2009; Fuller *et al* 2014; Malleson in preparation; Van der Veen 2007

desiccated tobacco seeds found in 2014, dated to the 17–18th century AD).

It is very easy to determine which units represent secondary remains and which represent tertiary 'background noise' ashes by looking at both the excavators' descriptions of the units and the relative numbers of items per litre, which, as can be seen from table 2, varies a lot between different units. Table 3 shows that the obvious secondary feature types (fireplaces and ovens) have high densities of charred macrofossils present: over 1000 items per litre (IPL). Ashy dumps (likely to derive from fireplace/oven cleaning) have almost 400 IPL, whilst all other feature types – dumps, floors etc. – all have below 200 IPL. Identifying this adds to our understanding of the individual stratigraphic units highlighting the need for possible re-interpretation of any which fall outside the expected pattern. For example there was just one unit described as a floor which has (see table 3) a density of 1004 IPL. This falls outside the general pattern of tertiary units from this site (usually below 200 IPL), and so the interpretation of this unit is brought into question.

Table 3 Average IPL for different unit types

Unit type	Average IPL
Cut	22.6
Dump	148.44
Dump - ashy	383.26
Dump - sandy	83.48
Dump - tomb	95.8
Dump / silo collapse	60.8
Dump?	173.8
Fireplace	1236.75
Fireplace / dump?	85.2
Floor	1004
Floor? - sandy	8
Natural	1.4
Oven	1283.8
Tomb	28
Wall	177.6

Taxa present

The most abundantly occurring plant remains in the samples from this period are:

Emmer wheat chaff (*Triticum turgidum* subsp. *dicoccum* glume bases and spikelet forks)
Ryegrass / darnel grains (*Lolium* sp.)
Possible wild sorghum grains (cf. *Sorghum arundinaceum / halpense*)
Spike rush seeds (*Eleocharis* sp.)[11]
Clover seeds (*Trifolium* sp. type)

Other taxa present:
Grasses / cereals
Canary grass (*Phalaris* sp.)
Stray grains of possible bread / hard wheat (*Triticum aestivum/durum*)
Barley is present (*Hordeum vulgare*) but the material is not in good condition so it is impossible to know if this is 2-row or 6-row barley.

Reeds and sedges
Rushes (*Schoeneplectus* sp. type) including clubrush fruits (*Schoeneplectus* cf. *praelongatus*)
Annual fimbry fruits (*Fymbristyllis bisumbellata*)
Cyperaceae fruits and tubers including tigernut / chufa (*Cyperus esculentus*)

Legumes
Pea family seeds (Vicieae tribe) including bitter vetch (*Vicia ervilia*)
Clover seeds (Trifolieae tribe) including meliot (*Melilotus* sp.), burr medic (*Medicago* cf. *polymorpha*) and prickly scorpion-tail (*Scorpiurus muricatus*)
Nile acacia fruits and seeds (*Acacia nilotica*).
Lentils (*Lens* sp.) (traditionally viewed as cultivated)

Fruits
Fig fruits (*Ficus carica* and *F. sycomorus)*
Grape seeds (*Vitis vinifera*)

Oil / fibre plants
Flax seeds and capsule fragments (*Linum usitatissimum*)

Other uncultivated / wild taxa
Polygonaceae including dock/sorrel seeds (*Rumex* sp.)
Carpetweed seeds (*Glinus lotoides*)
Purslane seeds (*Portulaca oleraceae*)
Pink family seeds (Caryophyllaceae) including campion / catchfly (*Silene* sp.)

[11] NB The 'kernal' or seeds are more abundant than intact fruits of this genus

Goosefoot family (Chenopodiaceae) including beet nutlets (*Beta vulgaris*)
Rose family seeds (Rosaceae)
Mallow seeds (Malvaceae)
Primula family seeds (Primulaceae)
Daisy family seeds (Asteraceae)
Tamarisk twigs (*Tamarix aphylla* and *T. nilotica*)
Stinking nightshade (cf. *Hyosycamus niger*)

As is the case for all other archaeobotanical reports from this site, taxa belonging to the Trifolieae and Vicieae tribes are grouped as legumes. These may represent plants cultivated as fodder (thought to have been the case at the nearby site of Tell el-Maskhuta[12]) but recent work elsewhere in Egypt has questioned the notion of specific fodder cultivation.[13] These plants may be a part of this assemblage due to the adoption of an agricultural strategy which integrated livestock and arable farming (an informal version of intercropping[14]).

Phased discussion of results

Phase G3 – earliest 2nd Intermediate period (samples from settlement remains in area 4)

A few remnants of structures were discovered in excavations either side of Petrie's Wall 2 (part of the New Kingdom Fortress left in-situ) in area 4 during excavations in 2014.[15] Three samples were taken – two from ashy dumps (1311), (1405) and one 'floor' layer (1315). The assemblages of charred plant remains in the two dumps (tertiary dump features of re-deposited waste) were similar. (1311) did contain a higher density of remains (see table 2 and fig. 4) but the overall ratios of different plant types was similar (see table 4). The key difference between these two samples was that the assemblage in (1405) contained a higher percentage of legumes and weeds. This may be connected to the higher presence of dung in that sample: the legumes and weeds may be the remains of animal fodder / grazing preserved via the use of dung as fuel. (1311) contained a higher density of indeterminate items – primarily 'type 1' which has been recently tentatively identified as termite faeces.

(1315) was described by the site team as being a floor, but the exceptionally high density of plant remains (1004 IPL) suggests otherwise. The sample was overwhelmed with dung fragments, just a small number of which were charred sheep/goat pellets; the majority were looser fragments, most probably from cattle. Additionally, the sample contained a high count of *Eleocharis* sp. seeds, with just a few fruits. The damaged condition of these items hints at the possibility that the seeds may represent the preserved remains of plants consumed by cattle (i.e. having survived digestion, coming from dung), suggesting grazing along watercourses / edges of pools, or foddering with 'imported' cereal processing by-products from wetter fields (or even a combination of the two). The question of the formation process of the deposit is harder to answer. The high density of charred plant remains does suggest that it is not a floor surface, but the extent of the unit means that it cannot be a secondary feature (fireplace / oven). Other possibilities are that it is a dump from a specific burning event, perhaps disposal and clearing of animal pens followed by dumping this ash into an unused space within the settlement.

The differences between the two samples richer in dung ((1315) & (1405)), indicates a varied pattern in the diet of the livestock. It goes without saying that the dung is produced daily, but the samples are not from secondary features (fireplaces /ovens) which can easily contain the remains from just one day of burning. These samples are from tertiary features which built up over a much longer time. Therefore these remains probably reflect diet for a somewhat longer span of time, perhaps up to several months. The difference

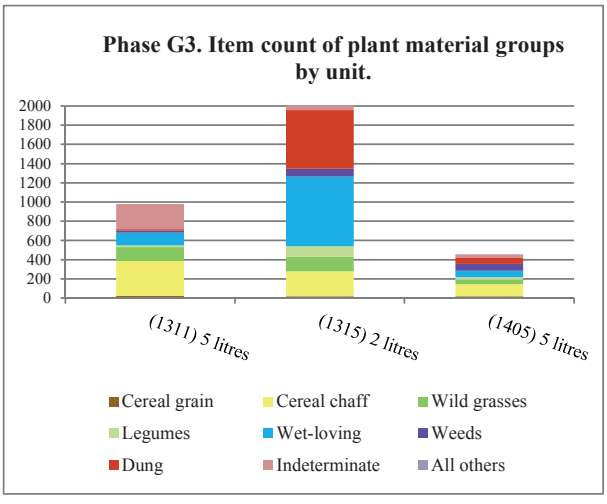

Fig. 4 Histogram of item count for major plant groups, phase G3

[12] Crawford 2003
[13] See Malleson 2016 for discussion
[14] See Malleson 2016 for discussion
[15] Rzepka *et al.* 2015, 101–102

Table 4 % of assemblage of major plant groups, phase G3

Phase G3. % of assemblage of plant groups										
Strat. Unit	Unit type	Cereal grain	Cereal chaff	Wild grasses	Legumes	Wet-loving	Weeds	Dung	Indeter-minate	All others
1311	Dump - ashy	2.35%	37.14%	14.80%	1.73%	13.47%	2.35%	1.53%	26.63%	0.00%
1315	Floor	0.85%	13.10%	7.57%	5.43%	36.06%	4.13%	30.28%	2.49%	0.10%
1405	Dump - ashy	3.94%	27.35%	10.28%	6.13%	14.66%	15.54%	14.66%	6.78%	0.66%

could be attributed to seasonal variation, or to difference in diet of different animals: the precise stratigraphic relationship between these two features cannot be determined due to the presence of the large Ramesside fortification wall (Wall 2) running through this area.

Phase G2 – 2nd Intermediate period (samples from cemetery in area 7)

Samples were taken from four deposits in or around Hyksos tombs in area 7, excavated in 2012.[16] All of these units are tertiary fills / dumps so the charred plant remains in them are a result of general scattering of ashes (windblown, trampling etc.) (see table 2). Only the most ubiquitous taxa and plant elements are present in these samples – mainly emmer chaff. The only other plants present in any significant quantities are ryegrass grains (*Lolium* sp.), three types of reed/sedges (spikerush, annual fimbry and one indeterminate cyperaceae), plus indeterminate item type 1 – possible terminate faeces. Fig. 5 shows the difference between the dumping features which probably consist of re-deposited settlement waste, and the feature of what must be windblown scatter; unit (907) which contained just two identifiable taxa – 110 annual fimbry seeds (desiccated potentially not ancient, not found in other units (from this phase)), and one grain of *Lolium* sp. The high presence of wet-loving species present in units (917) and (927) adds to the pattern of high presence of these plant types in samples from the Hyksos period (noted previously[17]). An as-yet unidentified small-seeded cyperaceae was in fact the most abundantly found taxa in the samples from this phase: also present were *Eleocharis* sp. seeds and fruits.

Whilst there are differences between these samples (see table 5), all four clearly consist of windblown / scattered remains, with low densities

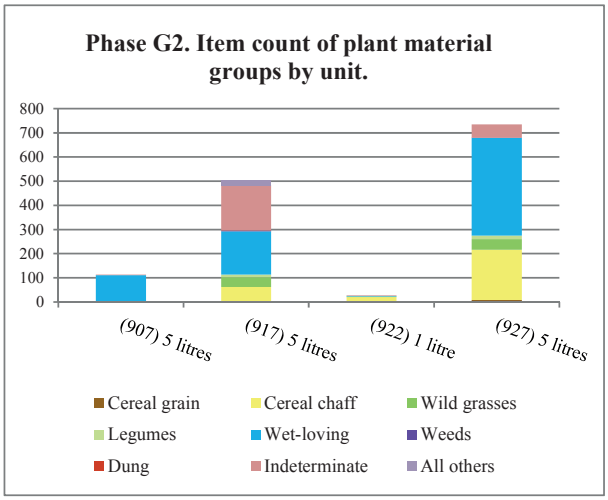

Fig. 5 Histogram of item count for major plant groups, phase G2

Table 5 % of assemblage of major plant groups, phase G2

Phase G2. % of assemblage of plant groups										
Strat. Unit	Unit type	Cereal grain	Cereal chaff	Wild grasses	Legumes	Wet-loving	Weeds	Dung	Indeter-minate	All others
907	Cut	0.00%	0.00%	0.88%	0.00%	97.35%	0.00%	0.00%	1.77%	0.00%
917	Dump - sandy	0.59%	11.68%	7.92%	2.18%	35.45%	0.79%	0.20%	36.83%	4.36%
922	Tomb	7.14%	64.29%	10.71%	0.00%	10.71%	0.00%	0.00%	7.14%	0.00%
927	Dump - tomb	1.09%	28.30%	5.99%	2.04%	54.97%	0.14%	0.14%	7.35%	0.00%

[16] Rzepka *et al.* 2014

[17] Malleson 2015, 192–194

of items (all below 200 IPL, see table 1). As such they represent the dispersal of charred plant waste from (probably nearby domestic) tertiary dumps deriving from fireplaces and ovens / kilns. This assemblage therefore reflects the very general pattern of plants utilised as fuel, deriving primarily from the use of cereal processing by-products in this instance. As noted above (and previously) the high presence of wet-loving taxa indicates either the use of imported cereal processing by-products (used as fuel) from wet fields elsewhere, or wet local conditions that resulted in flourishing reeds and sedges growing within cereal crops.

Phase G1 – final 2nd Intermediate period phase (samples from area 9 cemetery)

Several burials and tombs dating to a later phase of the 2nd Intermediate period (Hyksos) were uncovered in 2011 during excavations in area 9.[18] Four samples were taken from fills within the burials, all probably deriving from tertiary scatters of general waste (garbage) in the area. Of the four samples, only one contained a significant quantity of charred plant remains – unit (812) (see fig. 6) – all four fall clearly within the group of 'background noise' ashes (all around / below 200 IPL, see table 2). There are only minor differences between the assemblages of charred plant remains in these samples: notably, the two associated units from tomb [810], ((810) & (812)) contained both cereal grains and chaff, whilst those from other burials contained only cereal chaff (see table 6).

The interpretation of these deposits is the same as for the units from Phase G2 (see above). As with the material from Phase G2, seeds (and fruits) of wet-loving taxa form a significant percentage of the assemblages – but less than for the earlier phases. The grains of other wild grasses (ryegrass and canary grass (see table 6)) are present in higher quantities, probably indicating a slight 'drying up' of the local pools/reservoirs.

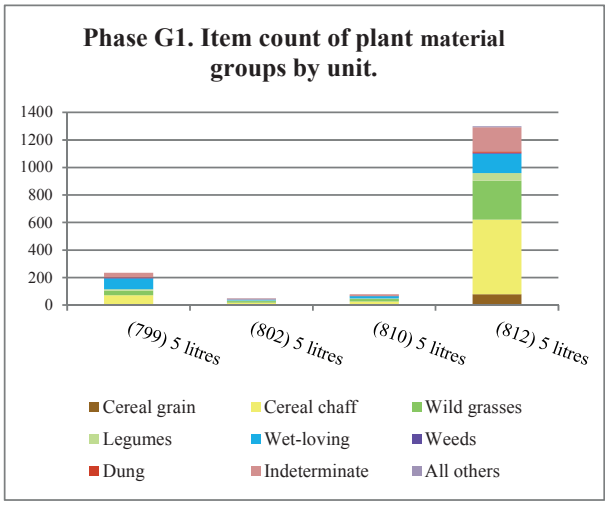

Fig. 6 Histogram of item count for major plant groups, phase G1

Phase F4 – earliest 18th dynasty settlement remains (samples from areas 3 & 4)

Four units containing ephemeral ashes from general dumping were sampled from this phase, from excavations in area 3 (2010) and area 4 (2011).[19] The richest sample is from (529) (see fig. 7), which, although clearly not *in situ* ashes, did contain a higher density of plant materials than other ephemeral dumping features (235 IPL). The plants which dominate this sample are those which are most ubiquitous at the site – Emmer wheat chaff, ryegrass/darnel grains (*Lolium* sp.), Trifolieae tribe

Table 6 % of assemblage of major plant groups, phase G1

Phase G1. % of assemblage of plant groups										
Strat. Unit	Unit type	Cereal grain	Cereal chaff	Wild grasses	Legumes	Wet-loving	Weeds	Dung	Indeterminate	All others
799	Dump -tomb	0.00%	30.77%	13.68%	5.13%	32.91%	2.99%	0.43%	14.10%	0.00%
802	Dump -tomb	0.00%	36.73%	22.45%	8.16%	14.29%	2.04%	0.00%	14.29%	2.04%
810	Dump -tomb	6.41%	28.21%	20.51%	5.13%	23.08%	1.28%	0.00%	15.38%	0.00%
812	Dump -tomb	6.08%	41.72%	21.86%	4.16%	10.78%	0.54%	0.77%	13.63%	0.46%

[18] Rzepka *et al.* 2014

[19] Rzepka *et al.* 2011; 2014

(clover) seeds, and spikerush (*Eleocharis* sp.) – suggesting that this material derives from the same type of source (cereal processing by-products) and activities (use of these products as fodder / fuel followed by dumping / scattering) as elsewhere on the site.

All the plant remains from this phase are typical of the 'background' noise of the most ubiquitous items of cereal processing by-products found across the site (emmer wheat chaff, wild grass grains, seeds and fruits of common crop-weeds). With the exception of the sample from the 'natural' beneath the silo in Area 3 (534) (which contained only 7 items in total) there is very little difference in the ratios of the main plant group types between these samples (see table 7). Unit (707) from Area 4 did contain fewer legumes and more indeterminate items (primarily indeterminate item type 2, as yet still unidentified). The most important observation drawn from looking at these samples is the lack of seeds/fruits from wet-loving plants (reeds / sedges) and high presence of wild grasses – potentially reflective of a continuation of the 'drying up' of the local area noted in phase G1.

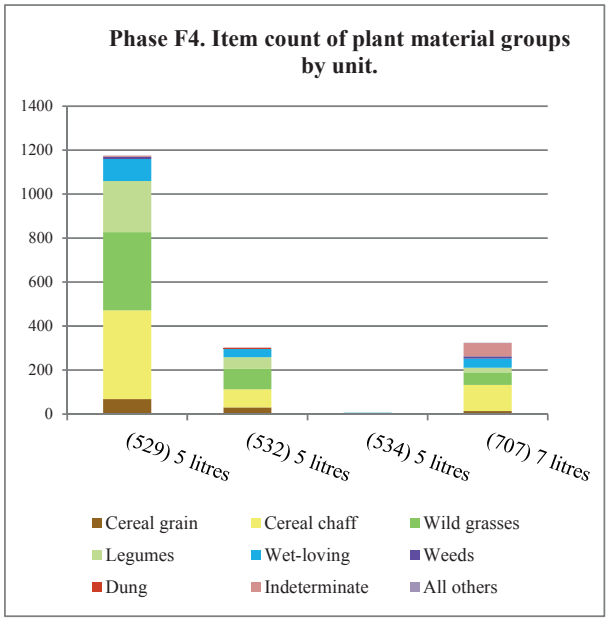

Fig. 7 Histogram of item count for major plant groups, phase F4

Phase F3 – second phase of 18th dynasty settlement remains (samples from areas 3, 4 & 7)

The larger number of samples taken from this phase[20] is primarily due to the fact that remains from this phase were found across areas 3 (2009, 1 sample), 4 (2011, 8 samples & 2014, 3 samples) and 7 (2012, 1 sample). The outcome of having a larger number of samples is that more meaningful conclusions can be reached due to having a far more statistically viable set of data.

The majority of the samples were from tertiary features (dumps of waste) (see table 2). There were two samples from secondary features – ashes *in situ* in ovens (669) & (710) – both of which had high densities of charred plant remains (over 1000). Unit (1406) from area 4 was described as being an ashy dump but contained a remarkably high density of plant remains (2361 IPL).

Secondary features of in-situ ashes

Both (669) (fill of oven [664]), and (710) (fill of oven [709]) were located close to the complex of so- called 'black houses' of the 18th dynasty in area 4.[21] Of the two, the sample from (710) was by far the richer with 1421 IPL ((669) = 1077 IPL) (see table 2). An interesting comparison can be made between these ovens and those found in area 9 dat-

Table 7 % of assemblage of major plant groups, phase F4

Phase F4. % of assemblage of plant groups										
Strat. Unit	Unit type	Cereal grain	Cereal chaff	Wild grasses	Legumes	Wet-loving	Weeds	Dung	Indeterminate	All others
529	Dump	5.79%	34.38%	30.21%	19.83%	8.51%	0.77%	0.00%	0.43%	0.09%
532	Dump / silo collapse	9.87%	27.30%	30.59%	17.11%	12.50%	0.66%	1.32%	0.66%	0.00%
534	Natural	28.57%	0.00%	42.86%	14.29%	14.29%	0.00%	0.00%	0.00%	0.00%
707	Dump - sandy	4.32%	36.73%	17.28%	6.79%	12.65%	3.40%	0.00%	18.52%	0.31%

[20] Rzepka *et al.* 2011; 2014; 2015

[21] Rzepka *el al.* 2014, 59

ing to the 19th dynasty – 3rd Intermediate period.[22] In the later period there was a general trend to choose dung as the primary fuel, whilst in these 18th dynasty ovens this seems not to have been the case. Whilst it is almost impossible to be certain due to the fact that charred dung has a tendency to crumble to dust, the charred plant assemblages from the later phase ovens consisted of an average of 15 % dung, whilst dung makes up less than 1 % of the assemblages from these 18th dynasty ovens (see table 8), strongly suggesting that dung was not a major fuel source. Additionally, over 50 % of the assemblages in the samples from (669) and (710) consisted of charred emmer wheat chaff (see table 8). The conclusion drawn from this is that these installations were fuelled primarily with cereal processing by-products (mainly chaff). This is of interest because these materials burn fast and are harder to control and therefore are less well suited for work that requires longer and more stable temperatures, suggesting perhaps that these installations were in fact small domestic ovens.

Tertiary dumps and 'background noise' ash scatters

The majority of the units sampled in this phase across all areas were described as dumps, and whilst several had a relatively high density of remains (150–180 IPL see table 2), statistically speaking they all fall into the category of 'background noise' scattered ashes (below 200 IPL). Only (897), (697) and (1406) contained over 200 IPL. (1406) was in fact the richest sample in this phase (see discussion below). Whilst these deposits were undoubtedly all formed in different ways, generally speaking they all consist of domestic waste, dumped in / around the settlement area. There are no obvious patterns to the assemblages from these different units that might shed any specific light on activities within the area (see fig. 8). What is worth noting is the fact that the quantities of seeds from wet-loving plants (reeds / sedges) varies considerably across the samples from this phase: some samples having a quantity of wet-loving taxa seeds relatively similar to the earlier 2nd Intermediate period samples, whilst others have far lower numbers, less than half in some cases.

Unit (1406) (area 4, excavated 2014) was described in much the same way as any other deposits from this phase as a general layer / dump of ashy-looking material (see table 2). During processing (flotation) it was noted that this sample was especially 'black and dusty/powdery', and the sample proved to contain a very high count of one indeterminate seed (type 2 – as yet unidentified). This (very prevalent) seed is particularly small (between 250–350 µm) – perhaps accounting for the apparent dustiness of this sample. However, even if these seeds are not counted, unit (1406) still has an IPL of over 1770 due to the fact that it also contains an exceptionally large number of emmer glume bases. This unit was relatively extensive – not just a small discrete patch of ash – and so cannot be interpreted as a fireplace (which might explain the unusually high density of remains).

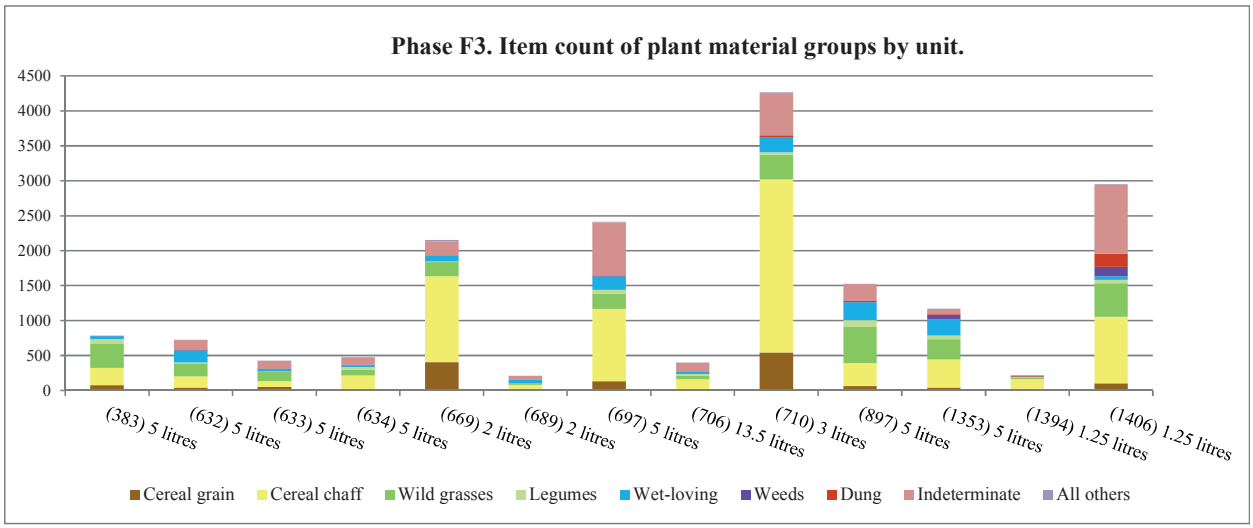

Fig. 8 Histogram of item count for major plant groups, phase F3

[22] Malleson 2015, 195

Table 8 % of assemblage of major plant groups, phase F3

Phase F3. % of assemblage of plant groups										
Strat. Unit	Unit type	Cereal grain	Cereal chaff	Wild grasses	Legumes	Wet-loving	Weeds	Dung	Indeter-minate	All others
383	Dump - ashy	9.48%	32.39%	44.43%	8.07%	5.12%	0.13%	0.00%	0.00%	0.38%
632	Dump - sandy	5.83%	22.19%	26.07%	1.39%	23.99%	0.69%	0.42%	19.28%	0.14%
633	Fireplace / dump?	11.27%	20.89%	30.05%	2.11%	9.15%	0.00%	0.23%	25.82%	0.47%
634	Dump	2.71%	42.38%	17.75%	7.31%	6.05%	0.21%	0.00%	22.76%	0.84%
669	Oven	18.70%	57.26%	9.28%	0.42%	3.57%	0.46%	0.00%	9.28%	1.02%
689	Dump - sandy	6.64%	31.28%	12.80%	0.95%	20.85%	0.00%	0.95%	26.54%	0.00%
697	Dump - ashy	5.43%	42.89%	8.96%	2.53%	7.80%	0.46%	0.21%	31.52%	0.21%
706	Dump - sandy	1.76%	39.04%	14.11%	4.28%	9.57%	0.76%	0.00%	30.23%	0.25%
710	Oven	12.73%	58.04%	8.26%	0.94%	4.88%	0.07%	0.75%	13.84%	0.49%
897	Dump - ashy	4.13%	21.59%	34.45%	5.91%	16.80%	1.31%	0.33%	15.42%	0.07%
1353	Dump - ashy	3.51%	34.53%	25.02%	4.37%	20.05%	5.40%	0.77%	6.17%	0.17%
1394	Wall	10.36%	61.71%	11.71%	4.50%	1.35%	0.45%	2.25%	7.66%	0.00%
1406	Dump - ashy	3.49%	32.25%	16.29%	1.59%	1.69%	4.71%	6.37%	33.43%	0.17%

One possible reason for the dustiness, and the density of (very degraded) glume bases might be that this sample contained a lot of totally pulverised charred dung. As noted earlier, charred (cattle) dung breaks up very easily, turning to a fine black dust. The degraded condition of the glume bases could well be a result of their having passed through the digestive system of a ruminant (e. g. cattle). Whilst emmer chaff (spikelet forks / glume bases) are tough and usually survive digestion, the chewing action and digestive enzymes can cause considerable damage[23]. An explanation for the extraordinary density of charred macrofossils in this sample (which is hard to prove without further excavation) is that this may be an area of intense dumping from a nearby installation (oven / kiln?).

Phase F2 – final phase of 18th dynasty settlement remains (samples from areas 3 & 7)

Units dating to the latest phase of the 18th dynasty were excavated in areas 3 (2009–2010 seasons[24]) and 7 (2014 season[25]): 6 dumps, 1 floor (with less secure dating) and 1 fireplace were sampled (see table 2). Units (1345) and (1348) provide the most informative data. (1348) was a secondary feature (fireplace) and (1345) was almost certainly a dump consisting of remains from ovens / fireplaces – both had high IPL (see table 2). What is especially interesting about the charred plant assemblages in these two units is the fact that both contained a very high proportion of wild grass grains (see fig. 9 and table 9). (1345) contained a large number of ryegrass / darnel (*Lolium* sp.) grains, whilst (1348) contained a large number of what have been identified as probable wild sorghum grains (*S. arundinaceum / halapense*). Unlike the fireplaces from the 19th dynasty and 3rd Intermediate period phases,[26] this fireplace did contain the remnants of charred dung. During the 18th dynasty the pattern of fuel use noted for the later periods[27] seems almost to be reversed – chaff being the primary fuel in ovens (see above) and dung being used in fireplaces (alongside chaff).

23 Valamoti 2013

24 Rzepka *et al*. 2011

25 Rzepka *et al*. 2015

26 Malleson 2015, 194–95

27 Malleson 2015, 194–96

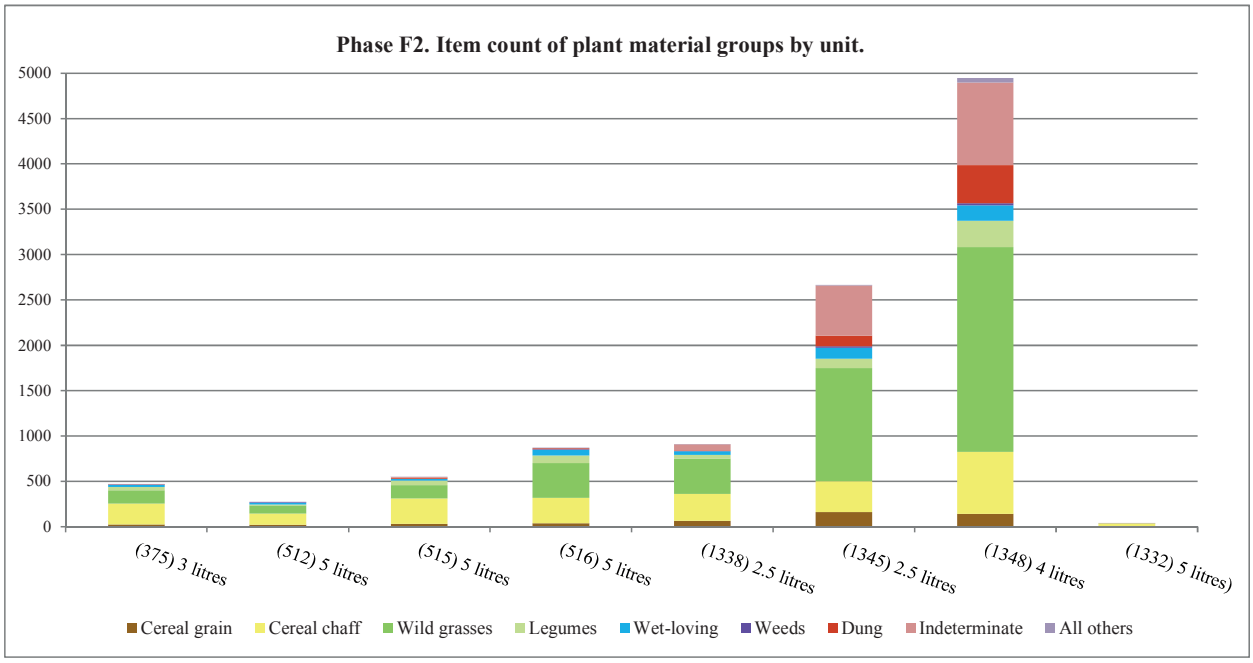

Fig. 9 Histogram of item count for major plant groups, phase F2 (and F2-C)

Table 9 % of assemblage of major plant groups, phase F2 (and F2-C)

Phase F2. % of assemblage of plant groups										
Strat. Unit	Unit type	Cereal grain	Cereal chaff	Wild grasses	Legumes	Wet-loving	Weeds	Dung	Indeter-minate	All others
375	Dump	4.89%	49.15%	31.28%	7.66%	5.53%	0.21%	0.21%	0.21%	0.85%
512	Dump - sandy	6.99%	45.96%	33.09%	3.68%	6.99%	2.57%	0.00%	0.00%	0.74%
515	Dump	5.66%	51.46%	26.46%	9.12%	4.01%	0.00%	2.01%	1.09%	0.18%
516	Dump?	4.14%	32.34%	44.07%	9.67%	7.36%	0.69%	1.27%	0.00%	0.46%
1338	Dump - sandy	6.93%	32.89%	43.01%	4.40%	4.40%	0.33%	0.66%	7.15%	0.22%
1345	Dump - ashy	6.05%	12.77%	46.90%	3.76%	4.66%	0.45%	4.51%	20.80%	0.11%
1348	Fireplace	2.83%	13.85%	45.66%	5.86%	3.44%	0.46%	8.49%	18.44%	0.97%
1332	Floor? - sandy	12.50%	70.00%	10.00%	0.00%	0.00%	0.00%	0.00%	7.50%	0.00%

The relative proportion of the assemblage consisting of the seeds / fruits of wet-loving taxa (reeds / sedges) is considerably lower than for the earlier phases – well below 10% of each sample (see table 9), strongly suggesting that the local areas of cultivation dried up or that the water level in local pools and reservoirs dropped considerably. It is worth noting that the drop in seeds / fruits from wet-loving taxa is mirrored by the increase in the numbers of grains from wild-grasses.

Discussion

The data from the analyses of the 2nd Intermediate period – 18th dynasty archaeobotanical samples adds to the growing picture of plant use at Tell el-Retaba.

The question of whether the fluctuating quantities of wet-loving taxa present in the charred remains reflects local conditions or conditions elsewhere (via use of imported cereal products)[28] is really answered by the results of the geological

[28] Malleson 2015, 194

work reported in 2015.[29] That study showed that there was a reservoir / waterlogged depression on the north-western edge of the site, with flooded land to the west and east. This reservoir / pool and the local flood lands regularly dried up / re-flooded due to either changes in local climate or changes in the patterns of water flow from the local Nile branch. The main flood-silts did not reach this far along the wadi and the local soils were very sandy, therefore dried-up especially quickly when the supply of water decreased.[30]

This pattern of changing water levels was observed in the charred plant macro-fossil assemblage several years ago,[31] and as more samples are analysed the additional data continues to reflect the same pattern. The area appears to have been wet during the 2nd Intermediate period, then gradually dried up during the late 18th – early 19th dynasty. A sharp increase in the presence of reeds / sedges is apparent in the later 19th – early 20th dynasty phases, suggesting that the reservoirs / pools were active and the local area became wetter once again. The presence of wet-loving taxa then slowly declined, indicating another dry period near the end of the 3rd Intermediate period into the Late period (see fig. 10). As was noted for the 19th dynasty and 3rd Intermediate period phases, the ratios of wet-loving taxa and wild grasses appear to have an inverse correlation to each other – during the drier phases where fewer reeds / sedges are present in the assemblage, there is a greater presence of wild grasses, but the changes are fairly gradual. Looking more closely at the phased detail for the 2nd Intermediate period – 18th dynasty samples (see fig. 11) this is very apparent.

The question of whether these charred plant remains derive from local plants or from 'imported' plants may well now have been answered. The geological survey indicated that the environmental /climate conditions around Tell el-Retaba did fluctuate a lot. The changing ratios of wet-loving plants and wild grasses tie into this information, and do therefore seem to indicate the use of local flora within the settlement, possibly for all periods. Additionally, several sickle blades found during excavations also point towards local cultivation of cereals. Knowing this, it will now be possible to look more closely at the assemblage and perhaps come to some conclusions about animal husbandry. It was noted in 2015[32] that the assemblage is relatively homogeneous over time, with the only major changes being the quantities of reed / sedges and wild grasses. However, knowing that the materials almost certainly do derive from local

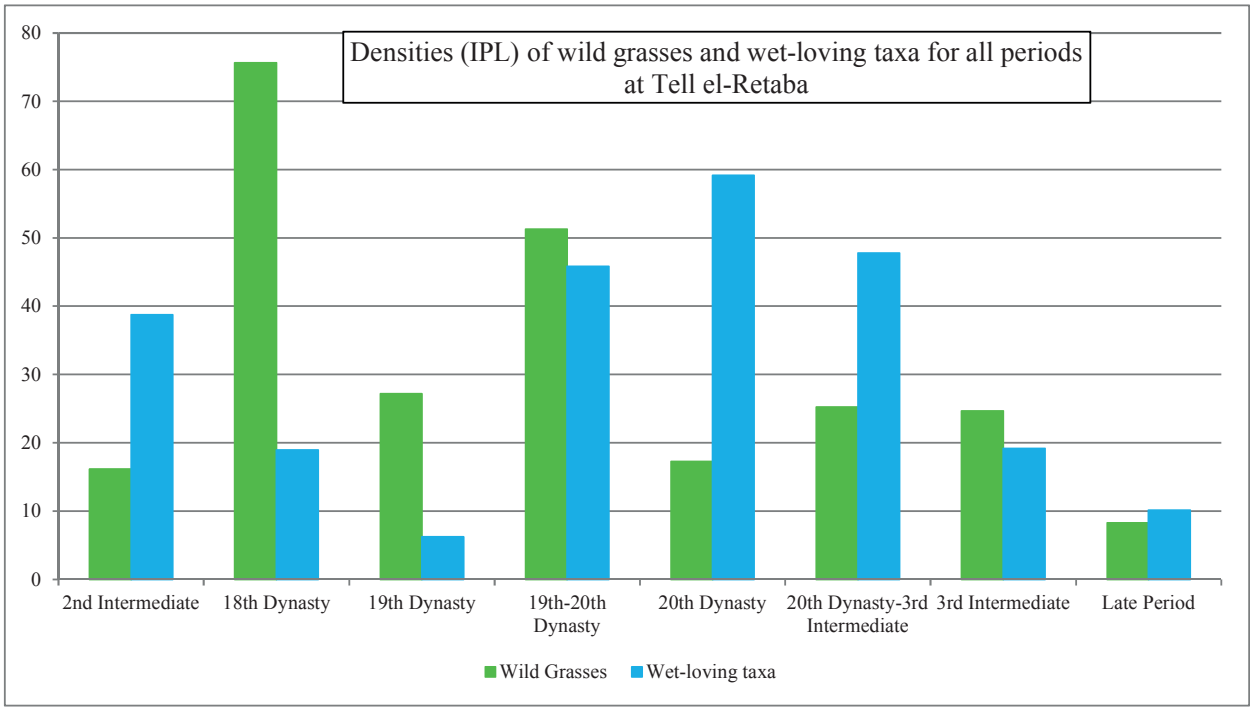

Fig. 10 Densities (IPL) of wild grasses and wet-loving taxa for all periods at Tell el-Retaba

[29] Rzepka *et al.* 2015, 149–160
[30] Rzepka *et al.* 2015, 156–160
[31] Malleson 2012a, 176; 2014, 106
[32] Malleson 2015, 197

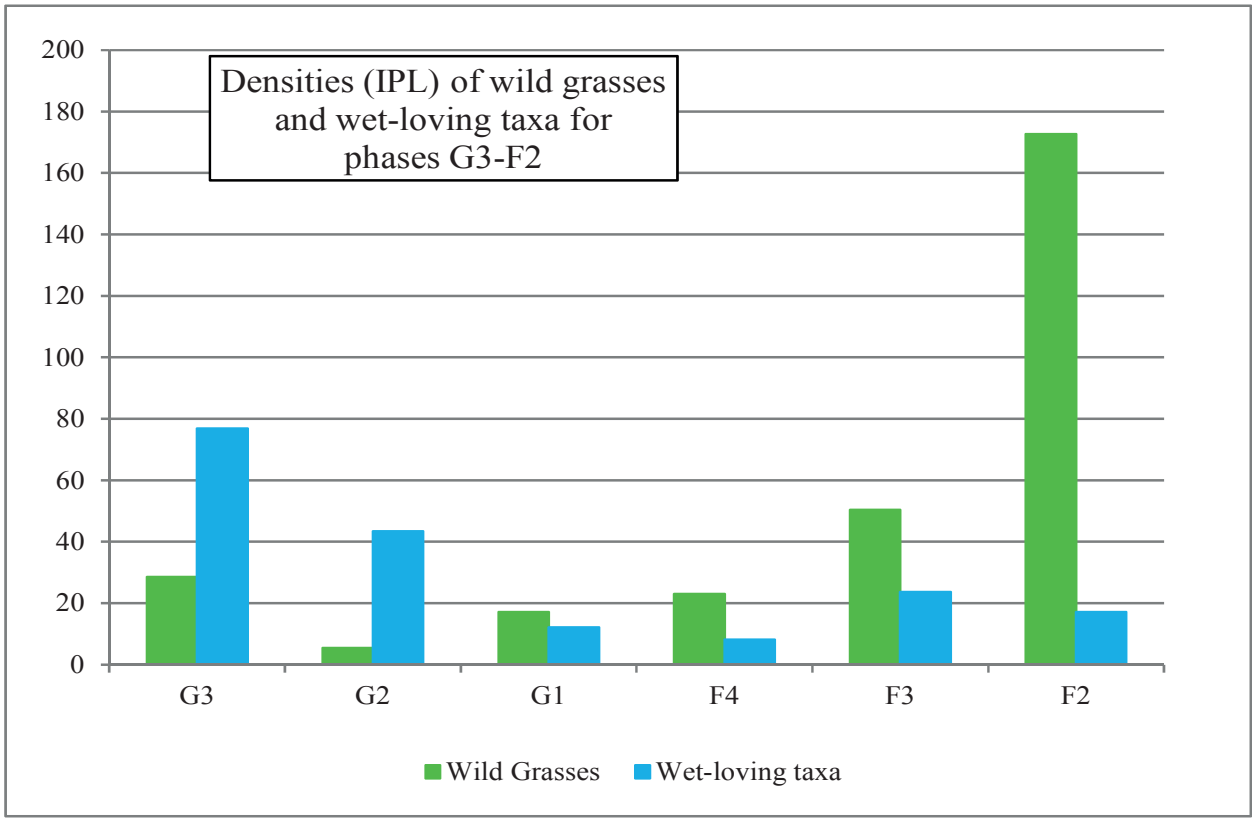

Fig. 11 Densities of wild grasses and wet-loving taxa for 2nd Intermediate period – 18th dynasty phases at Tell el-Retaba

crops / fields, it may now be possible to look more closely and attempt to establish if the animals (responsible for the dung burned in these settlements) were provided with fodder, or allowed to graze. By looking at the seasonality of the various taxa found (particularly the assemblages of dung-rich samples), it may be possible to determine if all the non-cereal plants are those which come into fruit at the same time as emmer and barley; suggesting foddering with cereal processing by-products, or if some ripen earlier / later; which might indicate grazing. This is something which requires further and more detailed study in the future.

Emmer wheat is the most abundantly found cereal at Tell el-Retaba. For the 2nd Intermediate period – 18th dynasty samples emmer chaff is present at a density of around 260 IPL, whilst barley chaff is just above 5 IPL. This is a dramatic difference and the easy conclusion is that emmer was the dominant cereal. However, the recognition that it is possible that most of these remains derive from the use of dung as fuel[33] (even in samples with only minimal amounts of preserved dung fragments), does mean that this data has to be taken with caution. Barley chaff is considerably less robust than emmer chaff, and therefore does not survive the digestive process of ruminants in the way the emmer chaff can do (or indeed the charring process). The lack of barley rachis internodes in these samples may be more a reflection of the fact that the samples derive from the use of chaff as fodder and dung as fuel than a reflection on the ratio of emmer to barley grown locally.

The increasing evidence for the use of dung as a major fuel in the site matches the evidence from nearby Tell el-Maskhuta.[34] The working hypothesis at that site, and also now at Tell el-Retaba, is that this was due to a lack of suitable local wood for use as fuel. The geological (and botanical) evidence points towards a situation of rather unstable local conditions with water supplies fluctuating a great deal, possibly only supporting the growth of smaller shrubby trees – leading to a reliance on the use of dung from animals grazing locally and / or being foddered on locally grown cereal processing by-products. The occupants of the settlements at Tell el-Retaba seem to have been fairly self-reliant on an agricultural system integrating livestock and arable farming, but more work is needed to add detail to this hypothesis.

[33] Malleson 2015, 196

[34] Crawford 2003

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