Food for the people of medieval Leicester: the evidence from environmental archaeology

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Introduction

Food remains recovered as a result of environmental sampling during archaeological excavations have been analysed in order to contribute to the understanding of life in the past. Excavations in Leicester during the last 20 years have been extensively sampled, and tonnes of soil have been processed by wet sieving and flotation on fine meshes for the recovery of tiny remains of plants and animals, adding to the evidence from the larger animal bones and oyster shells recovered by hand.

The remains recovered from samples included small animal bones including those of fish, fish scales, shell of various kinds, insect remains, together with charred cereal grains and seeds which would not be found otherwise. Small samples have also been taken to examine them for microscopic remains such as pollen and parasite ova, together with samples for the analysis of soil and sediments in order to recover evidence of the surroundings and living conditions. The results from sampling have provided evidence of foods available to the people in the town and countryside as well as some evidence of the environment and economy in medieval times.

Extensive sampling was carried out for the first time in Leicester on the Shires excavations in 1988-89, at Little Lane and St. Peter's Lane, recovering a wide range of remains. The results showed that charred plant remains were common but often present at a low concentration (Moffett 1993, Monckton 1995). More selective bulk sampling was carried out at Causeway Lane and Bonners Lane in order to extend this information (Monckton 1999, 2004a). This was continued on other sites in the town, particularly for the recent Highcross Excavations which included the sites at Freeschool Lane, Vaughan Way (St Margarets Baths site), and Vine Street (Buckley forthcoming) and some of these results are described below. Excavations in local villages have also been sampled but these have usually been only small interventions; although evidence is accumulating more is required. It is hoped that comparison of plant remains from the town with those from the villages will contribute to an ongoing study of how the people were provided with food and other commodities.

This paper describes the remains of actual food ingredients recovered from medieval deposits in Leicester and its locality, and concentrates mainly on plant remains, particularly the staple cereals, to expand on earlier reviews of environmental archaeology (Monckton 1995, Monckton 2004b). Much of the data is in archive reports so the sites with charred plant remains are listed at the end of this paper in Table 4. The village sites are described by John Thomas (this volume) and Leicester sites by Richard Buckley (this volume).

It is intended that the sample data will be studied and recorded on a database for the museum service in a project at ULAS (Radini in progress). The available foods are summarised from some Leicester excavations and are listed in Table 1. The crops, food plants, cultivated plants and some of the weeds are shown in Table 2.

Phases

The common phasing established for the Leicester Highcross excavations is used: Saxon AD *c.*450-850, Saxo-Norman 850-1150, earlier medieval *c.*1100-1250, medieval *c.*1250-1400, late medieval *c.*1400- 1500, post-medieval 1500-1750, modern 1750-present. The site phases are usually dated by pottery styles using pottery terminology for the region (Sawday and Davis 1999), some overlap occurs but samples are usually from selected datable contexts.

Preservation in the soil

Most of the sediments in Leicester are free-draining, 'dry' rather than waterlogged, and animal bones are generally well preserved on the sites, including fish remains recovered from sieved samples. Plant remains such

as seeds and cereal grains that are burnt can become charred and so do not decay and are preserved in most types of deposits within the city and have also been recovered from excavations in the local villages. These remains generally represent plant products such as cereals, which come into contact with fire during their processing, use or disposal; they can provide information about plant materials used or consumed on the site. Plants such as legumes, which may not require parching in their processing, and vegetables, which may not be allowed to go to seed are not often preserved, so more extensive sampling is required to increase the chance of their recovery. Other remains including charcoal, oyster shell, and eggshell have also been found, typically in rubbish pits and these provide evidence about food preparation, cooking, and foods available in the past. Evidence of other activities has also been found from some deposits particularly from charred cereals in malting kilns.

Some remains were found to be preserved by mineral replacement, usually called mineralisation, which occurs in conditions found in cesspits where sewage and latrine waste was dumped, and the organic remains become impregnated with calcium salts which preserve them in a semi-fossilised state. Mineralised food remains include fruit stones and pips which often occur together with small fish bones which passed through the gut and were then deposited in the pit as sewage. These pits also preserved microscopic eggs of human gut parasites confirming their use as cesspits, with occasional finds of coprolites (mineralised faeces) adding to this evidence for the disposal of human waste. Mineralised remains of flies including the latrine fly, were also preserved showing the putrid conditions in the pits (Skidmore 1999).

Material preserved by waterlogging is more rare in the town although some pollen was recovered from the wells and deeper pits (Greig 1994, 1999). More extensive waterlogged deposits have been found occasionally such as at the Austin Friary which provided some additional evidence of the surrounding environment (Mellor and Pearce 1981).

Food for the people

The available food as found from remains in sieved samples and hand-collected bones and shell is summarised by period below with examples from some sites shown in Table 1 opposite.

Cereals

At the Saxon site at Eye Kettleby free-threshing wheat was found, most probably bread wheat, as a change from spelt (a glume or husked wheat) which was cultivated in the Roman period. Barley was the most common cereal found there and is the cereal most tolerant of damp growing conditions. In Leicester the deposits associated with the Saxon building at Bonners Lane produced only a small number of grains of free-threshing wheat and barley, and little was found in samples from a single small pit of Saxon date at Causeway Lane. Saxon deposits at Freeschool Lane have yielded similar evidence for bread wheat grains and barley. Saxo-Norman deposits from both Leicester (at Freeschool Lane) and the villages also contain bread wheat, barley, oats and a little rye, with wheat as the most numerous cereal.

In post Norman Conquest deposits in Leicester in addition to bread wheat a second type of wheat called rivet wheat has also been found and they occur together in samples dating from the 11th -13th century from the Shires and Causeway Lane excavations (Moffett 1993, Monckton 1999), and in late to post medieval contexts from the Shires and at Bonners Lane (Moffett 1993, Monckton 2004a). Both are productive cereals although rivet wheat was not so good for bread making unless mixed with other cereals, but it could have been used for pottage, which was a thick soup and a staple medieval food. Rivet wheat has long straw which is useful for thatching. These cereals are distinguished by their chaff, and identifiable chaff (rachis) of bread wheat together with that of rivet wheat has been found at a few sites outside Leicester (see below).

Bread wheat was favoured for milling to use as flour for bread making, although the whole grain was also used in frumenty (boiled cracked wheat) and pottages. Other cereals found at this time include barley and oats, both often used for brewing (see below), as well as for porridge, pottage and griddle cakes; rye was also used as a mixed grain for bread making.

Period	Cereals	Vegetables and Garden.	Fruit and Nuts	Meat and Game	Poultry and Game	Fish	Seafish and Shellfish
Saxon	Bread wheat Barley	Peas/ Beans	-	Cattle Sheep Pigs	Fowl Goose Duck Woodcock	Pike Perch Salmon Eels	Herring
Saxo-Norman	Bread wheat Barley Oats, Rye.	-	Hazelnuts Bramble Elder.	Cattle Sheep Pigs	Fowl	Carp family	Herring
Earlier medieval c.1100-1250	Bread wheat Rivet wheat Barley Rye Oats	Beans Peas Cult. Vetch Leeks Flax	Hazelnuts Sloe Apple	Cattle Sheep Pigs Rabbit	Fowl (eggs) Goose (eggs)	Eels Salmon Pike Tench Perch	Herring Thornback Cod Ling Mackerel
Medieval c.1250-1400	Bread wheat Rivet wheat Barley Rye Oats	Beans, Beans/ Peas Cult. Vetch Flax Opium-poppy	Hazelnuts Apple	Cattle Sheep Pigs Hare Rabbit	Fowl (eggs) Goose (eggs) Duck (eggs) Teal Swan	Eels Perch	Herring Thornback Cod Ling Haddock Oysters
Late medieval	Bread wheat Rivet wheat Barley Rye Oats	Beans Peas Cult. Vetch Flax Leeks Violet Mustards	Hazelnuts Blackberry Raspberry Figs	Cattle (+ dairy) Sheep Pigs Fallow Deer Hare Rabbit	Fowl Goose Duck Teal Woodcock Pigeon Swan	Eels Grayling Pike Dace Chub Tench Perch	Herring Thornback Cod Ling Mackerel Plaice Haddock Oysters Mussels
Post-medieval	Bread wheat Barley Rye Oats	Beans, Peas, Flax, Dill, Hops, Asparagus, Opium-poppy, Marigold, Columbine.	Hazelnuts Bullace (plum) Blackberry Raspberry Apple Figs Grape	Cattle (++dairy) Sheep Pigs Fallow Deer Hare Rabbit	Fowl Goose Duck Woodcock Pigeon Swan Turkey	Eels Salmon Pike Gudgeon Roach Tench Perch	Herring Thornback Cod, Ling Mackerel Plaice Haddock Gurnard Whiting Turbot Smelt Oysters Mussels

Table 1: Foods available in Leicester by period, examples of Saxon from Bonners Lane, Saxo-Norman from St Nicholas Place, earlier medieval to post-medieval from the Shires.

Source of information: Saxon period Bonners Lane (in Finn 2004), Saxo-Norman period in St Nicholas Place (Kipling 2009), earlier medieval to post- medieval the Shires excavations 1988-9, plant remains (Moffett 1993), animal bones (Gidney 1991-93), fish remains (Nicholson 1992), shellfish (Monckton 1994). The additional evidence for eggs is from Causeway Lane only (Boyer 1999). (Thornback = Thornback ray).

Fruit and nuts

At Anstey samples contained some hazel nutshell as evidence of gathered food, and charred fragments of hazel nutshell have been found on most sites throughout the medieval period in the town and in the country. They are not numerous but are a common find so must have been a popular gathered food.

Figure 1: Fruitstones from Freeschool Lane: mineralised plum and cherry stones

Only hedgerow fruits have been recovered occasionally from the villages. In contrast cesspits from the town and southern suburb have preserved a wide range of fruit remains (Fig 1).

From *c.*1100 AD onwards in the town at the Shires and Causeway Lane the range of fruits included sloe, wild plums, blackberry and elder probably gathered from hedgerows, with probable orchard fruits of damson, cultivated plum, apple and pear; grapes and figs could both have been imports. At St Nicholas Place abundant remains from a cesspit within the undercroft included gathered plant food represented by hazel nutshell, sloe stones, blackberry and elder, with occasional fig seeds.

A greater variety of fruit remains was recovered from late medieval cesspits, cultivated fruits including apples and plums, with strawberries of the wild type which can also be grown in gardens, and figs also very numerous as imports. Both quantity and variety of fruit increased in the late medieval period, including the strawberry and very abundant figs, perhaps related to better-off people. More of this evidence has been recovered from Freeschool Lane (Radini 2009). The York Road site also shows this domestic evidence with abundant fruit remains found in a late medieval cesspit there. Domestic and other activity in the southern suburb increased into the post-medieval period: cesspits at Bonners Lane and the Bowling Green Yard contained numerous fruit pips of figs and blackberry together with sloe, apple and grape. Grapes may have been imported, possibly as raisins, but local cultivation is a possibility.

Vegetables

In deposits from Leicester throughout the medieval period peas and beans were found (Moffett 1993, Monckton 1999). Food evidence from hearths of a *c.*1250-1400 phase are associated with brewing at Freeschool Lane and included abundant charred legumes, peas, beans and vetches from the hearths, probably from brewing vessels. The legumes in these deposits may be included incidentally as domestic waste burnt with the fuel, but the presence of so many is noteworthy and suggests that legumes were being consumed or processed on the site. It is possible that this was waste from drying legumes for winter storage using the same kilns as for malting (Radini 2009). Late medieval deposits from Bonners Lane contained numerous peas and beans and it was suggested that these were perhaps used as animal food for pig keeping there (Baxter 2004); this may also be the case at Freeschool Lane (Browning 2009). Few legumes have been found in samples from the villages although Anstey village deposits also contain possible edible legumes and fodder vetch. Elsewhere in England, legumes have been noted as being rare in charred deposits (Moffett 1994) as it is not necessary to process them by heating, however, because they have been found abundantly in Leicester it is suggested that they may have been parched by fire for winter food, and accidentally burnt in the process.

Other evidence for vegetables included leeks (Moffett 1993) found from a charred seed, and flax/linseed which has edible seeds (Table 1). Some of the Brassica seeds found could be from vegetables but they could not be identified further, they may be from cultivated plants such as cabbages and mustards, and some of this group are wild plants which are could be used as salads or added to pottage. Many wild plants have edible leaves, particularly

the young leaves of fat-hen and sorrel which would have been consumed in spring; they are a source of vitamins after the winter. Seeds of such plants are very common in all periods although it cannot be demonstrated that they were used as food.

Garden plants and herbs

These are rare finds; a few large post-medieval rubbish pits and a well at the Shires contained charred grains of cereals from domestic rubbish along with seeds of additional plants including dill, hops, asparagus and marigold which are all useful and were possibly garden plants (Moffett 1993). The fewer large pits and a stone-lined well may suggest that there were fewer properties in the area of the Shires at this time, possibly with large gardens, and at least one such residence is known on High Street from the 17th century (Courtney 2000). Pollen from a well at St Peters Lane included borage as a possible garden plant with edible flowers (Greig 1994). Opium poppy is an ornamental plant as well as having seeds that were used as food flavouring, a source of edible oil, and possibly for medicinal use; these seeds have been found in some of the cesspits. Mint has recently been found at Freeschool Lane which may have been used as a herb.

Fish

Other food remains included abundant fish bones and scales recovered from samples mainly from cesspits, with a scatter of scales found in many deposits in the town. Without sieving only a few of the larger bones are recovered by hand such as at the Austin Friars, while results from the Shires samples showed that a wide range of fish were consumed in Leicester in the Roman period, and increasingly throughout the medieval periods. A higher proportion of sea fish was found compared with Roman deposits, and there were more large sea fish, indicating fishing with improved technology in deeper waters during the medieval period (Nicholson 1992).

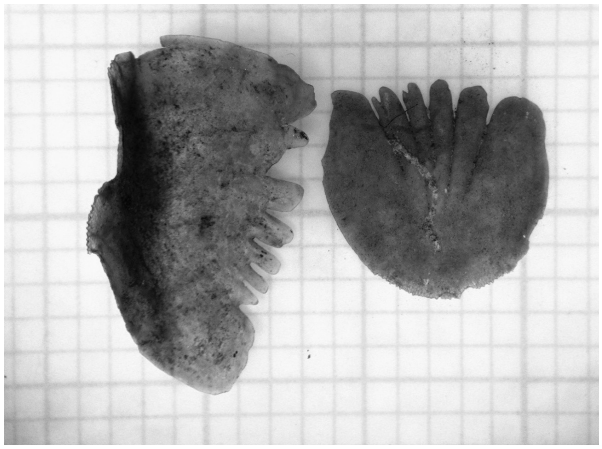

Figure 2a: Fish remains from Leicester Abbey: Perch Scales

Freshwater fish; grayling, pike, gudgeon, tench, perch and salmon were consumed, as in the Roman period, with the addition of roach, chub and dace in medieval times. Seafish in the Roman period included herring, smelt, gurnard and flatfish from inshore waters, with the addition of cod, haddock, ling, mackerel, plaice, turbot and thornback ray in medieval times (Table 1). Herrings and eels were the most common fish consumed in both Roman and medieval times in Leicester (Nicholson 1992). Similar results were found from Causeway Lane and at both sites the fish consumed were generally smaller; fish were not cheap and larger fish were consumed at the Austin Friary suggesting that the townspeople of the north east quarter were selecting more affordable cheaper fish (Nicholson 1999).

Samples from Leicester Abbey (Figs 2a, b, c) contained fish bones of sea fish including numerous herrings, with cod and plaice, as well as freshwater fish including perch with eels. Numerous scales of the carp family from the fills of drains in the kitchen area suggested that fish were an important part of the diet, perhaps because of wealth or for religious reasons. Sea fish such as herring would have been brought to Leicester preserved, probably salted, and the whitefish was probably dried and brought from the coast by carters at increased cost to cover transport (Dyer 2002). Freshwater fish would have come from rivers and fish ponds, whilst eels would have been

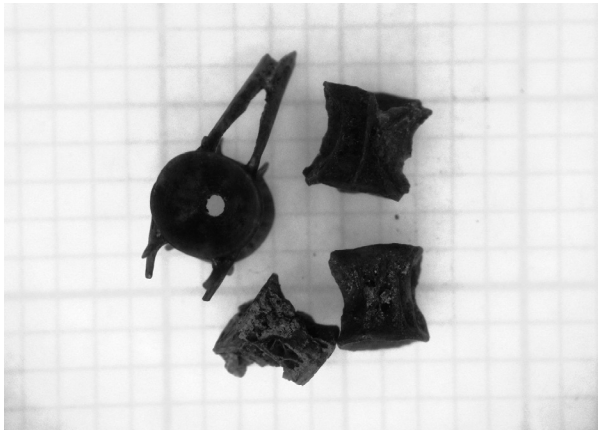

Figure 2b: Fish remains from Leicester Abbey: herring vertebrae

trapped in the rivers - eel traps are known from the Trent (Cooper 2000). Fish remains are rare on the village sites but characteristic of urban deposits of both Roman and medieval times.

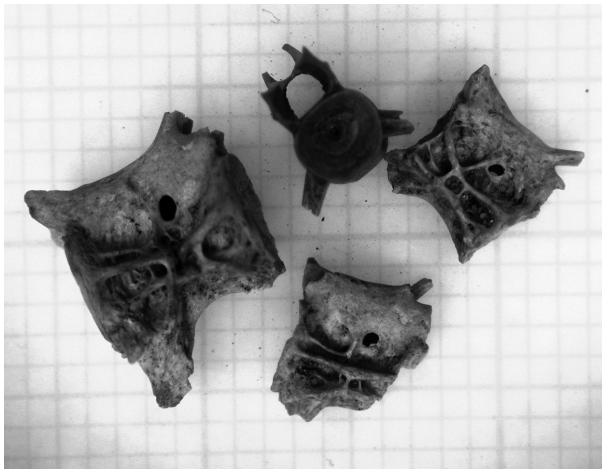

Figure 2c: Fish remains from Leicester Abbey: Eel vertebrae

Shellfish

Oyster shells from the Shires were analysed and found to be from managed oyster beds as the shells were regular in shape, but they were smaller and distinct from the Roman oysters so were from a different source (Monckton 1994). Other oyster shells found in Leicester at Causeway Lane in medieval deposits were found to be identical to the Roman shell so were judged to be residual (Monckton 1999b), and this was also the case at Vine Street (Hill 2009). Oysters seem much less common in medieval Leicester than in Roman times in the town. Other shellfish include mussels and occasional whelks. More oyster shell, together with whelks, was recovered from the Austin Friary than elsewhere in the town; this shows abundant supplies brought from the coast. However, techniques of analysis were not available at the time to investigate this further (Mellor and Pearce 1981). Oysters can survive for up to two weeks if kept cool and moist which allows time for transport. Shellfish and preserved sea fish may have been brought on the return trip from the east coast when exporting materials such as wool and cloth from Leicester and its area.

Eggs

Fragments of eggshell were found in pits of the medieval phases at Causeway Lane and identified as coming from hen, duck, goose and possibly pheasant, as evidence that the eggs were consumed (Boyer 1999). Further evidence for chickens kept for their eggs was from the bones of hens in egg-laying condition found in medieval pits at the Undercroft at St Nicholas Place (Baxter 1992). Eggshell from the Highcross sites will be identified in due course but less shell has been recovered overall from these excavations.

Poultry and Game

At Bonners Lane in the Saxon period bones of domestic fowl, goose, duck and woodcock were found and similar domestic and wild fowl were consumed in the late and post-medieval periods with the addition of hare and rabbit in the post-medieval period (Baxter 2004). Similar evidence has been found at sites in the town (Gidney 1999). A detailed comparison of the consumption of game and poultry is being made with the Highcross sites (Browning forthcoming).

Dairy

The evidence for dairy produce is indirect consisting mainly of the bones of calves used for meat as found in the late medieval and post-medieval periods at the Shires. Slaughter of calves increased over time and is evidence for milk production because the cows would have continued to produce milk after removal of the calf as they do today. Butter pots are know in the post-medieval period from elsewhere in the midlands but have not yet been found in Leicester. It is assumed that milk, butter and cheese were consumed at times but the evidence is difficult to find. Milk would not have kept long but cheese and butter could be stored for later use.

Meat

The consumption of beef, mutton and pork is seen throughout the medieval periods in the town (Table 1) and evidence of the butchery trade has been found at the Shires (Gidney 1991-93). In the late medieval period in the north east of the town there is little evidence from Causeway Lane, while at the Shires rubbish pits contained bones of larger sheep kept for wool before being used for meat, and calves used as veal suggesting the development of dairy products (Gidney 1991, 1992). In contrast in the southern suburb at Bonners Lane there is abundant domestic rubbish and even evidence of pigs being kept in back yards. This was apparently not always successful as several whole skeletons of a pig

and piglets were found in a pit and are thought to have died of disease (Baxter 2004). Pig keeping was also suggested at Oxford Street from the find of neonatal piglets (Browning unpublished).

Post-medieval evidence from the north east of the town from a rubbish pit at Causeway Lane showed that an improved breed of pig was being introduced (Gidney 1999). The study of animal bones is a large subject providing evidence for stature, age profiles, and butchery, and the variety of meat and animal products used over time: evidence is accumulating from the many Leicester excavations because animal bones have been recovered from most previous excavations as hand-collected material. The evidence for the recent Highcross sites will be compared with the rest of the town (Browning forthcoming). Little evidence has been found at present from animal bones in the villages to suggest where animals were raised for meat for the town.

Drinks

Ale is known from documentary sources (Dyer 1989) as a medieval staple drunk by men, women and even children of all classes, and large quantities of various strengths were produced regularly because ale does not keep well. Ale can be produced from any cereal, or mixture of cereals, and in Leicester oats formed a high proportion of the grain in the deposits of charred germinated grain presumed to be malt (marked 'M' in Table 4).

The earliest evidence is from Saxo-Norman deposits of oats probably for brewing at Freeschool Lane. Deposits c1100-1250 from Vine Street also contained mainly oats with some germinated, similar remains were found from a possible malting kiln at Vaughan Way and in the suburbs at Grange Lane, while at Oxford Street, also in the suburbs, a deposit of mainly barley with moderate germination is also thought to be brewing waste. Remains of charred oats from c1250-1400 were probably waste from the brewing process, were found from the Undercroft at St Nicholas Place, and at Vaughan Way. With the possible exception of the kiln at Vaughan Way, all these probably represent small scale domestic brewing of ale, possibly sold by householders to local people.

Large scale brewing was found in deposits with a high proportion of oats from Freeschool Lane from a stone-lined malting kiln c1250-1400 confirmed as malt from the high percentage of oat germination. The oats were mostly mixed with wheat or barley (Table 3). Water would have been available from wells or purchased from watermen, but may have been less safe to drink than ale which was boiled during preparation (see below). Herb teas may have been made from some of the plants found (Table 2). Wine was mainly an imported drink, known from documentary sources.

Other evidence from plant remains

Interpretation of samples

As well as providing evidence of the plant foods consumed (Table 1 and 2) samples can be investigated to find evidence of food production and trades. The types of plant remains in the samples can also indicate activities on sites and contribute to the characterisation of different areas of the town.

Charred plant remains representing cereal waste included cereal grains, chaff and weed seeds. After identification they were counted to find the proportions of each which can indicate the stage of cereal processing (van der Veen 1992). Deposits with a high proportion of grains represent the clean cereal product ready for use, while deposits with a high proportion of chaff and weed seeds represent waste from various stages of cereal processing and cleaning. Bread wheat, barley and rye are free-threshing cereals which are easily threshed from the chaff, so chaff would not be expected to be found with the grains far from where the cereals were grown and this is an unexpected find in the town. It must be remembered that straw was used in the town for animal bedding and other purposes and may be a source of chaff and weed seeds but is unlikely to be rich in grains.

Domestic occupation has been found to be typified by a low density scatter of charred cereal grains and weed seeds and occasional chaff fragments, with low numbers of charred items per litre of soil, probably representing waste mainly from food preparation (Table 4). This occurs on most types of sites where people lived and worked. Richer burnt deposits of grain can result from accidental fires during storage or use so deposits of clean grain can potentially occur at many sites where there was domestic occupation. However, cereals require processing for a variety of reasons

	Saxon	Saxo-Norman	Medieval Rural	Medieval Urban	Post-Med	
CEREALS						Botanical name
Wheat free-threshing grain	++	++	++	++	++	*Triticum* free-threshing
Wheat free-threshing chaff	+	+	+	++	++	*Triticum* free-threshing rachis
Bread wheat, chaff	+	+	+	++	++	*Triticum aestivum* s.l. rachis
Rivet wheat, chaff			+	++	+	*Triticum turgidum* type rachis
Spelt, chaff	1 r	1r	-	2r		*Triticum spelta* L.
Barley, grain	++	++	++	++	++	*Hordeum vulgare* L.
Barley, chaff	+	+	+	+	+	*Hordeum vulgare* L. rachis
Rye	+	+	+	++	++	*Secale cereale* L.
Oats	+	+	+	++	++	*Avena* sp.
LEGUME CROPS						
Beans or Peas	+	+	++	++	++	*Vicia/Pisum*
Beans				+	+	*Vicia faba* L.
Peas				+	+	*Pisum sativum* L.
Cultivated Vetch			+	+	+	*Vicia sativa* ssp *sativa* (L.) Boiss.
IMPORTS						
Fig				+/+*	+/+*	*Ficus carica* L.
Grape (m)				+	+/+*	*Vitis vinifera* L.
GATHERED or GROWN						
Hazel nut shell	+	+	+	++	+	*Corylus avellana* L.
Fruit stones, Sloes (m)	++	+		++	++	*Prunus* sp.
Bullace and Damson (m)				+		*Prunus domestica* L.
Apple or Crab Apple (m)				++	++	*Malus* sp.
Hawthorn	+					*Crataegus* sp.
Blackberry				+	+	*Rubus fruticosus* agg.
Elder	+	+	+	++	++	*Sambucus nigra* L.
GARDEN PLANTS						
Columbine					+*	*Aquilegia* sp.
Opium Poppy (m)				++	+*	*Papaver somniferum* L.
Borage (pollen)					P	*Borago officinalis* L.
Violet				+*		*Viola* cf *odorata* L.
Flax or Linseed	+			+		*Linum usitatissimum* L.
Grape (pollen)					P	*Vitis vinifera* L.
Wood Strawberry					+*	*Fragaria vesca* L.
Mint				+		*Mentha* sp.
Dill					+*	*Anethum graveolens* L.
Hop					+*	*Humulus lupulus* L.
Pot Marigold					+*	*Calendula officinalis* L.
Asparagus					+*	*Asparagus officinalis* L.
Leek				+	-	*Allium porrum* L.
CROP WEEDS						
Black bindweed			+	+	+	*Fallopia convolvulus* (L.) .
Cleavers	+	+	++	++	+	*Galium aparine* L.
Corn cockle		+	+	+	++	*Agrostemma githago* L.
Stinking Mayweed	+	+	++	++	++	*Anthemis cotula* L.
Other weed seeds	++	++	++	++	++	Weed seeds

Table 2: List of selected plants from Leicester, Leicestershire and Rutland by period.

Key: Remains are seeds in the broad sense unless stated, taxonomy after Stace (1991). r = residual?, + = present, ++ = found on over half the total sites of that period. Medieval includes earlier to late medieval periods (c.1100-1500). * = seeds from the Shires (Moffett 1993), P = pollen from the Shires (Greig 1994). (m) = mineralised. Remains are charred unless described otherwise.

from threshing on the farm to cleaning before consumption, so when grains and cereal waste seeds and chaff are found in comparatively larger quantities agricultural or commercial activity could be indicated by the higher densities of remains per litre of soil (Table 4).

Other activities include malting which is indicated by germination of the grains although germination can occur after a wet harvest or in poor storage conditions so the proportion of germinated grains is considered. Modern malting results in over 70% germination of the grains but lower levels have been found in some medieval deposits, perhaps because the cereals were less uniform (Moffett 1994), and poor preservation and damage by burning makes this more difficult to recognize. A further consideration is that oats can be used ungerminated to add to other malted grains to strengthen the brew (Amsterdam Museum 1994).

Domestic waste

By examining the type and density of charred plant remains in samples differences have been found between some areas of the town, and on the village sites. In Leicester a low density scatter of remains including cereal grains and weed seeds together with sparse chaff has been found in samples from the Shires and Causeway Lane. This is thought to represent waste from food preparation of whole grain for foods such as pottage (Moffett 1993), with the weeds from the final cleaning of the grain and a few spilled grains burnt in the hearth. Hearth cleanings containing this waste were dumped or accumulated in features on the site. Little grain would be expected in domestic contexts because in the medieval period bread flour is likely to have been produced by mills and bread purchased from bakers (Dyer 1989).

A similar low density scatter of charred plant remains has also been found in floor deposits and features associated with medieval buildings at Vine Street and Vaughan Way from the Highcross excavations, Leicester Abbey kitchen area, and also from some of the village sites (Table 4). At Anstey a low density scatter of remains was found on the house platform as evidence of the domestic activity there. Examples of village excavations which have produced only evidence of domestic activity from sparse charred plant remains with little or no chaff are Freeby, Barrowden, Claybrook Hall, and Stapleton (Monckton 2004c), although investigation of other parts of these villages may produce different types of evidence if the opportunity arises to investigate them.

A second type of domestic waste occurs in cesspits used for the disposal of sewage shown from the microscopic eggs of parasites of the human gut and they also contain fruit stones and pips together with fish remains as evidence of diet and intense domestic occupation. Cesspits have been found at the Shires and Causeway Lane associated with a scatter of charred plant remains, and have now also been found on other sites in the town and suburbs as evidence of domestic occupation. However, cesspits are uncommon finds on rural sites, perhaps because middens were used instead with the waste used to manure the fields, and this may be one of the reasons that finds of fruits and fish remains are rare outside the town.

Gardening

Although the evidence for garden plants, herbs and vegetables is based on only a few seeds it is probably significant because these remains are less likely to be preserved. Most of this evidence is from the post-medieval features at the Shires (Table 2), and may represent a garden there with pollen of borage and grape found in a well (Greig 1994), and seeds of garden plants in pits (Moffett 1993). Peas and beans are present throughout the period and could be field crops or grown in gardens, as could flax. It is likely that there were gardens in the town and surroundings and the produce contributed to the diet of the inhabitants (Dyer 2006). Ornamental flowers such as columbine would have been appreciated then as they are now and they are shown in many medieval illustrations. There are also likely to have been orchards for fruit in the locality.

Agriculture: crops from the countryside

In contrast to the samples with a scatter of charred cereals as domestic waste (see above) some samples with very abundant charred plant remains have been found at some sites. At Anstey samples from an earthworks ditch contained a high density of charred plant remains including chaff and weed seeds interpreted as evidence of the processing of cereals nearby as an agricultural activity on that part of the site. Chaff is more diagnostic than grains and the chaff of bread wheat showed that this was a crop grown there. A number

of these agricultural type assemblages with abundant chaff have been found in samples from some of the villages (marked 'A' in Table 4) showing the cereals cultivated and their processing. Anstey and Wyfordby have only bread wheat chaff, while a few others have a second type of wheat called rivet wheat (see above under Cereals). The occurrence of rivet wheat as well as bread wheat is of interest because both types of wheat have been found together in some deposits in Leicester.

Of the sites examined so far in Leicestershire and Rutland only the village sites of Saxby, Old Dalby and Whissendine have produced both rivet and bread wheat chaff, and both have been found at Sherrard Street in Melton Mowbray (Table 4). Rivet wheat is now known from an increasing number of sites in the midlands from the early medieval period onwards (Moffett 1991) and with the earliest find being from Higham Ferrers in Northamptonshire with a Late Saxon date (Moffett 2006). The evidence at present suggests that this crop was introduced and spread in use during the medieval period. All the local sites which have produced rivet wheat outside Leicester to the present are in Rutland or eastern Leicestershire which is on productive agricultural land, and may possibly have supplied these cereals through local markets (Monckton 2007).

The other cereals, barley, oats and rye have all been found to be abundant on some sites in the town and suburbs although they are not abundant in samples from the countryside with few exceptions; post-medieval remains of a barley crop at Whissendine (Table 4), and a deposit containing numerous rye grains has been seen from Coleorton which may be of maslin. Some medieval crops were grown as mixtures: oats and barley were grown as 'dredge' used as stock feed or for brewing, and wheat and rye were grown together as 'maslin' (Greig 1991), a mixed grain, usually wheat and rye. However, it is difficult to prove this from samples because cereal may have been mixed in use or disposal, a few exceptions have been found in Leicester (see below).

The weed seeds found with the cereals can indicate the type of land cultivated. More intense cultivation of the clay soils began in the Roman period and continued in the Saxon period as shown by the presence of the arable weed, stinking mayweed (fig 3), found at Eye Kettleby. The weeds found at Anstey in medieval contexts for example, include cleavers and corn cockle which are typical of autumn sown crops such as wheat and rye, while stinking mayweed again indicates the cultivation of heavy clay soils. The increase in the occurrence of this latter weed in medieval times is thought to be related to the use of the mould board plough (Greig 1991). The presence of leguminous weeds with the crop may indicate that it was grown after fallow or following a fodder crop, because some of the legumes are the size of cultivated vetch, perhaps suggesting this fodder crop was grown as part of a crop rotation system. These remains give a glimpse of what was growing in the village field system.

Figure 3: Mayweed with poppies

Crop remains found at Bonners Lane, Leicester, in a late medieval sample contained abundant barley grains with numerous seeds of vetches and tares together with stinking mayweed which became a very troublesome weed of claylands by late medieval times (Jones 1988). Other weeds which are characteristic of spring sown crops include black-bindweed found with barley, oats and the legume crops seen at Freeschool Lane (Radini 2009). An ongoing study of crop weeds may reveal more evidence about the sources of cereals for the town (Radini in progress).

Cereals traded in Leicester

Surprisingly, some rich deposits of charred cereals from the town have been found which appear to be 'agricultural type' assemblages of grains, chaff and weed seeds as crop remains (marked 'C' in Table 4), and are similar to some found in the countryside. Such samples do contain numerous grains and appear to be threshed but uncleaned cereal product rather than simple cereal waste. However it

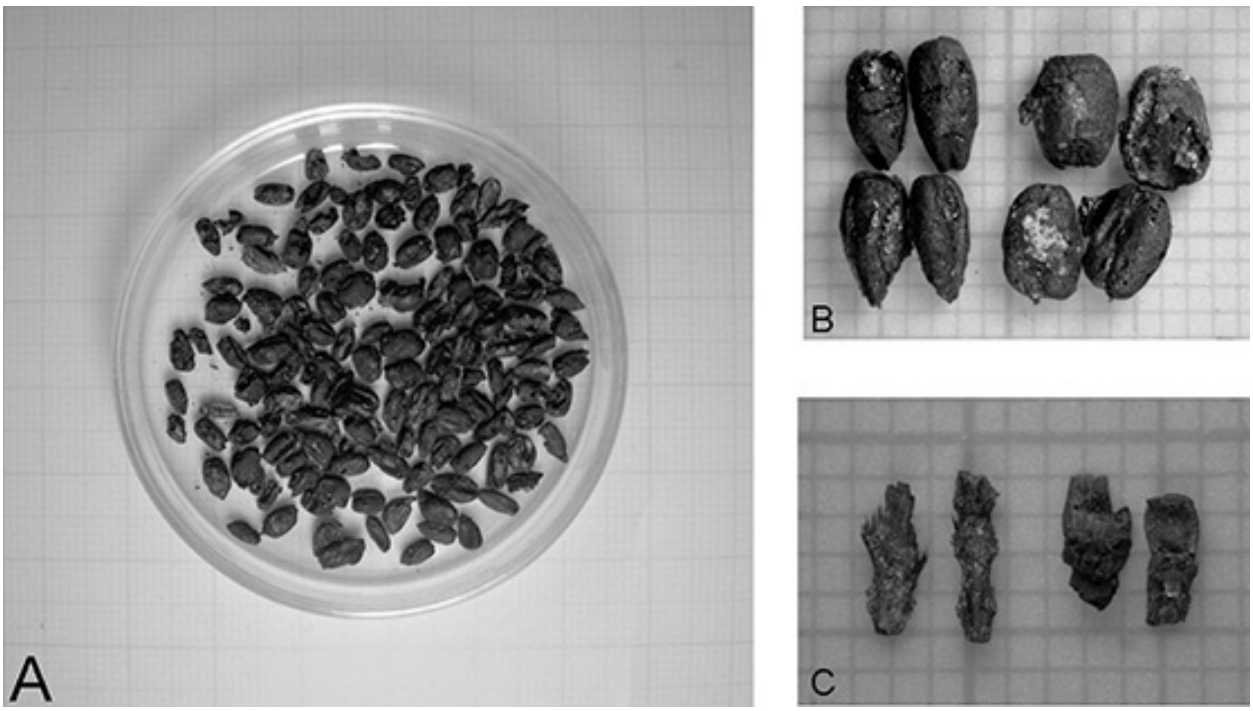

Figure 4: A: Maslin from Vaughan Way. B: charred rye and wheat grains. C: rye and bread wheat chaff (rachis).

is possible that they consist of grains mixed with cereal cleaning waste because cereal cleanings were often used as fuel in ovens and kilns for processing cereals. Cereals may have been dried in a kiln for storage if gathered wet or parched to facilitate milling (Moffett 1994, 2006). These may also represent commercial activities concerned with cereal supply and cereal cleaning, perhaps by corn traders. This certainly shows that uncleaned cereals were brought into the town, possibly some were grown in the town fields nearby. Some deposits show other trade activities associated with brewing with evidence of malted (germinated) grain. Different cereals or mixtures of cereals, were used for brewing on different sites at different times.

Saxo-Norman deposits from the town include partly-cleaned wheat grains with numerous seeds at Vaughan Way, and oats (probably for brewing) at Freeschool Lane with chaff and weed seeds present. Deposits of *c.*1100-1250 from Vine Street and Vaughan Way contained cereal cleanings from bread wheat crops, including rivet wheat at the former site as also found in the suburb at Grange Lane (Table 4). Also at Vaughan Way, a very rich deposit of a mixed crop of bread wheat and rye was found in a pit pre-dating part of the cemetery. This consisted of equal amounts of the two grains, with both types of chaff equally well represented together with some arable weed seeds (Fig 4). This is good evidence for the cereals being grown together as 'maslin' and the crop being brought to the town uncleaned but probably threshed. The cereal is all charred and may have been burnt accidentally.

Other crops were used for brewing. In the *c.*1250-1400 deposits at the Undercroft at St Nicholas Place, at Vaughan Way, and at Freeschool Lane, deposits containing oats have been found. The oats at Freeschool Lane had a high percentage of germination and were from a kiln, so there is good evidence these were malted grains for brewing ale. The former two deposits also contain a moderate amount of germination so may similarly represent waste from the brewing process (Table 3). There is some evidence for the use of a mixed crop of oats and barley, or 'dredge', used for brewing in this period at Freeschool Lane (Radini 2009). In the late medieval period at Bonners Lane rubbish pits contained such abundant charred barley grains that they must have been waste or accidental loss from some commercial use, however no kiln was found. Hulled barley was prepared for human consumption by parching and rolling to remove the papery hulls although this could not be demonstrated from the remains. Grain may have been prepared for sale at the site (Monckton 2004a).

The sites with evidence of cereal cleaning and processing at Vine Street and Vaughan Way are close to the areas of domestic occupation at Causeway Lane and the Shires where no evidence of cereal processing or brewing was found. So these two former sites may represent trade activities to supply the people living in the north east of the town with cereal grain as food and ale to drink. In earlier medieval times brewing was probably carried out in domestic kitchens to sell to people nearby whilst later brewing could be on a more commercial scale (see below). Corn suppliers may also have worked from their back yards, possibly cleaning grain for market as may be the case of the maslin crop at Vaughan Way.

The quantities of uncleaned cereal in the town suggest that it was grown nearby because transport was expensive (Dyer 2002) so it would have been uneconomic to transport cereals containing waste: an alternative explanation is that the waste may have bulked up the product for sale by the farmers and then been cleaned later during food preparation for use or sale to purchasers. However, Leicester had a system of town fields (Billson 1920) and some of the cereals are likely to have been grown nearby.

Baking and Cooking

There is little evidence for bread making because common ovens were used for most of the period which have not been excavated. It is known that the mills were controlled by the Lords of Leicester (Fox 1935) as were the bread ovens, and bakers were highly regulated by law (Billson 1920). Flour and bread would leave little archaeological trace although some cereal waste may be found. The only evidence for cooking may be suggested from some of the hearths found near houses and charred cereal remains in rubbish pits, probably removed from domestic hearths and dumped, which show food grains and legumes possibly to make pottage.

In the later medieval periods some households may have acquired individual bread ovens (Dyer 1989). The only possible bread oven bases found associated with cereal remains are post-medieval at Bowling Green Yard in Leicester and at Sherrard Street, Melton Mowbray, although ovens can be used to bake other foods such as pies and puddings. Unfortunately there is little to suggest what was cooked or whether it was for the household or for sale. There is little evidence at present to show how meat and fish and other foods were cooked although much is known from documentary sources. The only good evidence for a kitchen is from Leicester Abbey (Buckley 2006) with evidence of hearths and drains, however, only remains of food ingredients were found including cereals, legumes, fish and meat bones in the deposits.

Brewing

The site at Freeschool Lane is the first in Leicester providing substantial evidence for malting and brewing from the presence of charred cereal grains with a high percentage of germination in what are clearly malting kilns of c1250-1400 date. The evidence is extensive from the plant remains and from the remains of purpose built kilns so must have been carried out on a commercial scale (Coward and Speed 2009). The kilns found here consisted of conical pits lined with stone, presumably set in the floor of the building, with an elongated flue where the fire was set, presumably outside the building. They had lost the upper structures which would have supported the grains during heating over the conical chamber. However, it is known from documentary records that the grain was placed on matting of straw or horse hair over the heat. Fragments of burnt straw matting were found here which probably held the grain (Radini 2009), presumably the matting was supported on beams or slats over the heat. It must have been difficult to regulate the heat; fires were a common occurrence in towns (Dyer 1989). Even during successful runs of the kiln some grains would fall into the fire, or be included with cereal waste burnt as fuel, and so may be preserved by charring. The remains in the kilns are likely to be from the last few uses of the kilns: other features on the site contain dumps of charred remains which also provide evidence of brewing and the cereals used.

The process of brewing starts with preparing malt from germinated grain, firstly by soaking the grain, draining off the water, then piling the grain on a floor in a warm place to sprout turning the starch to sugar by the action of enzymes. This was carried out in a building, perhaps the upper floor of the brewhouse, because it takes several days and the grain must be turned to keep the germination even. When the cereal sprout was about the same length as the

Site Phase	Feature	Items/ litre	%Wheat	%Rye	%Barley	%Oats	%Germ*
Saxo-Norman							
Freeschool Lane	Layer G5008	1460	-	-	9.7	90.3*	30%
c.1100-1250							
Vine St	Pit G562	526	7.3	-	9.2	83.5*	15%
Vaughan Way	Kiln 525	43	20.1	3.4	0.7	75.8*	22%
Oxford Street	Hearth F51	255	1.3	-	85.1*	13.6	37%
Grange Lane	Kiln 302	579	50.9	1.2	2.4	45.5*	38%
c.1250-1400							
Vaughan Way	Oven 5487	5000	3	-	3	94*	36%
Undercroft	Pit F100	703	43.1	1.6	0.8	54.4*	18%
Freeschool Lane	Kiln 5987	601	11.1	2.2	30.8*	55.9*	76%
Freeschool Lane	Kiln 6064	43	-	-	29*	71*	63%

Table 3: Cereals for Brewing: Grains used for malt: the density of remains in the sample (items per litre of soil), followed by the proportions of each type of grain of the total identifiable grains, with the proportion of germinated grains.

*Key: %Germ = percentage of germination, * = the cereals showing germination (malting). Source of information: as Table 4.*

grain, as found in some of the samples (Radini 2009), the grain was heated in a kiln to stop germination by parching or lightly roasting, and then the grains are roughly ground and the malt sugars extracted in hot water.

From elsewhere it is known that extracting the malt from the grain was carried out in large cisterns, probably made from lead, installed over a hearth to heat the water. Only the remains of the hearth bases were found at Freeschool Lane. After extraction, the liquid was tapped off or bailed out and cooled, then fermented with yeast in a vat, barrels or troughs. Once the yeast was established some would be saved for future use; yeast was also used by bakers so the two trades were often connected. After fermentation of the sugars to produce alcohol the yeast settled out and the ale could be tapped off into barrels and sold. The drink produced here would have been ale, as elsewhere in medieval England at this time, in contrast to beer which is flavoured with hops which were not regularly used in England until late medieval times (Dyer 2002).

Ale does not keep well so would have been sold and consumed soon after it was ready. Herbs were sometimes used to flavour ale and include some members of the daisy family, sloe, elder, blackberry and mint (Behre 1999). Although these plants were represented on the site it cannot be shown from the evidence that they were actually used.

The cereals used here were mixed but contained a large proportion of oats (Table 33) which, it is of interest to note, were the main cereal used for brewing in the medieval period on the Continent where it was mixed with about 25% wheat, and / or barley (Amsterdam Museum 1994, 63). This seems to be the case in Leicester where oats are the most abundant cereal and were commonly used in some of the regions of England (Dyer 2002), and charred oats have often been found associated with medieval kilns (Moffett 2006). Germinated oats were also found as probable brewing waste in deposits at Vaughan Way and the Undercroft at St Nicholas Place (Tables 3 and 4). Barley became popular for brewing in the late medieval period particularly when hopped beers were produced, and barley is most commonly used today.

Ale was an important part of the medieval diet and is said to have been safer to drink than water because it was boiled in the process: a number of grades of ale were produced with weaker ale brewed for women and children.

Towns had a large demand for ale and brewing on a commercial scale would have been needed to supply the people and the site at Freeschool Lane was certainly one source of supply.

Conclusions

Charred cereal remains from the villages show that bread wheat was cultivated widely in the two counties with rivet wheat only found in north east Leicestershire and Rutland, although more samples are needed to investigate the distribution further. Barley was also common, with oats and rye found occasionally. Some rich samples representing agricultural waste were found from some areas of the villages in contrast to a scatter of domestic waste from food preparation.

In the town a similar scatter of domestic waste includes all the above cereals, while some samples similar to agricultural waste have also been found showing that uncleaned cereals were brought to the town and cleaned for use and supply to the townspeople. The question of whether the cereals were grown nearby in the town fields or transported uncleaned requires investigation. Evidence for brewing has been found from small scale activity in the Saxo-Norman period at Freeschool Lane, increasing in the period *c.*1100-1250 at Vaughan Way and Oxford Street, and then on a commercial scale at Freeschool Lane with kilns dating from *c.*1250-1400. The grains used for malting were mainly oats with some wheat and/or barley. Domestic occupation at the Shires and Causeway Lane in the period *c.*1100-1400 has been typified by a thin scatter of charred cereals thought to be from food preparation of whole grain foods such as pottage, together with a range of foods available from remains of fruits and fish found in cesspits. Abundant animal bones provide evidence of the meat consumed.

Areas with both domestic activity and commercial activity including cereal cleaning and brewing have been found at Vine Street and Vaughan Way suggesting these areas supplied the residential areas of the town *c.*1100-1250. Brewers at Freeschool Lane supplied ale to the townspeople in the period *c.*1250-1400 on a commercial scale. In addition other crops may have been cleaned and legumes processed at this site. Crop cleaning and possible brewing were also seen at Vaughan Way and St Nicholas Place, the latter perhaps brewing for a large household.

Late medieval domestic occupation evidenced by cesspits with abundant food remains has been found at Freeschool Lane and St Nicholas Place with less intense occupation in the north east quarter. Later occupation in the north east quarter consisted of at least one high status property and an area of trees and possibly gardens. In the southern suburbs from *c.*1100-1250 onwards and into the post-medieval period's domestic and trade activity concerned with cereal supply was associated with other trades such as tanning.

Evidence from the excavated samples shows the increasing variety of foods available over time, particularly fruit and fish found only in the urban deposits and monastic sites. Further work is planned at University of Leicester Archaeological Services to examine changes in the foods available over time and to investigate agriculture and the supply of plant-based foods to the town using the new evidence from the Highcross excavations.

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	Leicestershire and Rutland	Leicester	Leicester Suburbs
SAXON (*c*.450-850)	12. Eye Kettleby (40.3) 23. Castle Donington (4.9) 24. Willow Farm (1.4) 13. South St. Oakham (4.9)	2. Causeway Lane (12.5)	4. Bonners Lane (1.0)
SAXO-NORMAN (*c*.850-1100)	28. Whissendine (32.6)*A 20. Wyfordby (566)*A	3b. St. Nicholas Place (8.0) 8. Vaughan Way (344) C 9. Freeschool Lane (146)*M 9. Freeschool Lane (129) P 10. Vine Street (12.2) 3. Undercroft (12.5)	
EARLIER MED (*c*.1100 -1250)	13. South St. Oakham (6.7)* 14. Anstey Ditch (91.4)*A 21. Anstey Houses (9.6) 15. Freeby (37) 16. Saxby (45.4)*# A 17. Garthorpe (0.1) 18. Barrowden (1.9) 19. Claybrook Hall (21)* 22. Long Clawson (9.2) 32. Cottesmore (c.5)	1. Shires (50)*# 2. Causeway Lane (27)* # 2. Causeway Lane (9.8) P 10.Vine St. (526) oats/seeds C 8. Vaughan Way (3100) maslin 8. Vaughan Way (3000)*C 8. Vaughan Way (43) kiln M? 9. Freeschool Lane (7.0)	4. Bonners Lane (16) 5. Oxford St. (255) M 35.Grange Lane(574)# M 35.Grange Lane (190) P
MED (*c*.1250 -1400)	26. Stapleton (1.8)* 27. Seaton, Rutland (9.2) 28. Whissendine (34.0)*A 29. Dunton Bassett (1.8) 30. Sheepy Magna (1.8) 20. Wyfordby (17)* 11. Coleorton (++) ?maslin	1. Shires (10.6) 2. Causeway Lane (4.0) 3b. St Nicholas Place (8.0) 8. Vaughan W. (5000)* oats.M 9. Freeschool Ln. (466)* L. 9. Freeschool Ln.(601) oats M 10. Vine St. (69)*# C 3. Undercroft (703) oats M? 3. Undercroft (190)*# C	4. Bonners Lane (13.5) 34. Abbey Park (13.5)
LATE MED (1400 -1500)	33. Gt. Bowden (50) grains 25. Melton, S. St. (446)*	1. Shires (25.8) # 2. Causeway Lane (4.4) 3b. St Nicholas Place (379) P 9. Freeschool Lane (775)* L. 9. Freeschool Lane (16) P 3. Undercroft (138) grains	4. Bonners Lane (8.3) L 5. Oxford St. (36) 6. York Road (8.7)
POST-MED	31. Old Dalby (385)*#A 28. Whissendine (600)*#A Barley 25. Melton S. St.(195)*#	1. Shires (5) more garden plants 2. Causeway Lane (15) few cereals 3b. St Nicholas Place (15.1)	4. Bonners Lane (292) P abundant fruit 4. Bonners Lane (1178) *# C, Barley and seeds 7. Bowling Green Yard (693)*# C

Table 4: Comparison of maximum density of charred plant remains (items per litre of soil) from Saxon, medieval to post-medieval phases of sites by area. Sites numbered in order of analysis in area groups.

*Key: Figure in brackets = maximum density (items per litre of soil) of the best samples of the phase. * = Bread wheat chaff, # = Rivet wheat chaff, A = agricultural waste, C = cereal crop waste, M = malted grains, L = legumes, P = cesspit including mineralised remains . These samples used in table 3 except 32-35.*

Source of information for Table 4:

Sites: 1 (Moffett 1993), 2 (Monckton 1999), 3 (Boyer 1992), 3b (Monckton in Kipling 2009), 4 (Monckton 2004a), 5-7 (Monckton 1999c), 11-18 (Monckton 2004b), 19, 20 (Jarvis 2001, 2002), 21-31 (Monckton unpublished), 32 (Fryer 2008), 33 (Deighton 2005), 34 (Monckton in Buckley 2005), 35 (Monckton and Radini in Thomas in progress). Highcross Excavations: 8 (Monckton 2009), 9 (Radini 2009), 10 (Monckton and Radini 2009).

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