THE ISCA GRAIN, A ROMAN PLANT INTRODUCTION IN BRITAIN

By H. HELBAEK

National Museum, Copenhagen, Denmark

(*Received* 28 *October* 1963)

SUMMARY

Debris surrounding a deposit of carbonized grain found at the Roman fortress of Isca, Caerleon, Wales, was examined and various cereals, grasses and weeds identified. The find provides evidence of weed introductions new to Britain and of the use of cereals in brewing.

During excavations, in 1958, in the civilian settlement of the Roman legionary fortress of Isca at Caerleon in Wales (Boon, 1962), a deposit of carbonized grain was found in the destruction level of a timber hut (Anonymous, 1959). The structure had stood some 150 m south-west of the south-west gate of the fortress, beneath the metalling of a lateral street which flanked the boundary wall of a later, legionary parade ground. The hut rested on the levelled-off site of an earlier hut of *c.* A.D. 75–80, and may itself be dated within the period *c.* A.D. 80–130, when the street was first laid.*

Table 1. *Plants identified in matrix surrounding the deposit of carbonized grain found at Isca* (*the volume of the deposit was approximately* 1 *litre*)

CEREALS AND GRASSES	
Triticum spelta	× × ×
T. aestivum	? ×
Hordeum vulgare	×
Secale cereale	? × × ×
Avena spp.	1.15% of total
Bromus sp.	0.85% of total
Lolium perenne	2 fruits

NUMBERS OF OTHER SEEDS AND FRUITS			
Vicia faba var. *minor*	3	*Lathyrus aphaca*	6
V. hirsuta	1	*L. nissolia*	11
V. tetrasperma	24	*L. cicera*	1
V. cracca	1	*Polygonum convolvulus*	3
V. sativa	3	*Rumex crispus*	2
V. angustifolia	14	*Raphanus raphanistrum*	14
Lens esculenta	about 40	*Agrostemma githago*	1

RESULTS

The grain has suffered such severe damage by various agencies that it is now largely incapable of identification, but fortunately, the black debris in which it was embedded was removed and handed over for examination together with the grain. It proved to contain tiny fragments of spikelets, seeds of weeds and other details which, to some extent, counterbalance the destruction of the grain and furnish certain information regarding the grain and how it was treated, and also some clues to the circumstances under which it was grown (Helbaek, 1952). The plants identified are listed in Table 1.

* A full report of the excavations of 1954–63 in the area south-west of the legionary fortress will be published as a monograph by the National Museum of Wales in due course and will include a summary of the findings of this paper.

Cereals

Practically all the cereal grains have lost their shape in that their lower (embryo) end is shrivelled and contracted in consequence of sprouting, while the upper end is puffed and featureless. Often a wide groove runs over the dorsal side, framed by sharp parallel 'banks', and in many cases it still contains a sprout as long as the grain. While the grains were thus deprived of most of their specific features through changes at germination, the final effacement was brought about by the effect of heat on such semi-liquid bodies.

A few grains show traces of longitudinal ridges along the flanks and the ventral furrow caused by lost paleas, and this refers them to hulled barley. In some of them even a slight twist is still discernible by which they may be classified as belonging to a six-row spike (*Hordeum vulgare* L.). However, this cereal made up only a negligible proportion of the sample.

The majority of the grains are smooth and devoid of morphological characters; most of them seem to have been longish, which suggests emmer, spelt, and rye, but whereas it is possible by the spikelet parts to demonstrate the presence of spelt (*Triticum spelta* L.), there is no evidence for emmer (*T. dicoccum* Schrank). Very many grains are tantalizingly suggestive of rye (*Secale cereale* L.) without any proper proof being available (Helbaek, 1952, Plate xxiv, c). Finally, a minor proportion are blunt and subglobular; it seems not unreasonable to suggest that they may belong to a free-threshing wheat, club wheat or bread wheat (*Triticum aestivum* L.). Unfortunately, the state of the corn prevents relevant measurements being obtained and, therefore, the various dimensions cannot be used for more detailed determination, by comparison.

The evidence for the presence of spelt is good. When the spikelet of spelt burns, all tender portions of the glumes and paleas disintegrate or are consumed, leaving at the most (beside the grains) the woody, roughly fork-shaped base or the detached, solid bases of the glumes. The width of the glume base (Dim.B.) is one of the best criteria by which to distinguish emmer and spelt, two species otherwise not easily told apart in the carbonized and disintegrated state (Helbaek, 1952, p. 216 and Fig. 11). In our material the glume bases vary from 0.96 to 1.40 mm (mean 1.16 mm), practically the same figures as found in the Early Iron Age spelt from Fifield Bavant in Wilts, and in the Roman period find of Rivenhall, Herts. (Helbaek, 1952, p. 218). The Danish, first century A.D. find from Dalshoj offers a good contrasting example of emmer. Here Dim.B. is much smaller, viz. 0.57–1.03 mm with a mean of only 0.75 mm (Helbaek, 1957). If further proof were necessary, the position of the internode in relation to the detached spikelet offers another clue (Helbaek, 1952, Fig. 11). In emmer, the internode points downwards and is attached to the spikelet base by its upper, broader end; in spelt, it is the lower, narrower end that is attached to the base, the internode stretching upwards closely along the ventral side of the spikelet. Several fine examples of the latter condition are found among the Isca spikelet fragments.

Weed grasses

Very many weed seeds occur among the grain, the most numerous being oats and brome grass. The dimensions of their grains are given below:

Avena spp.		*Bromus* sp.	
Length:	3.67–7.33 mm	Length:	5.00–6.00 mm
Width:	1.50–2.33 mm	Width:	1.84–2.00 mm

The naked caryopses of species of the genus *Avena* are very difficult to specify because, at least in the carbonized state, they are practically identical apart from their size. All specific characters in this genus lie in the glumes and paleas, and such are only exceptionally preserved, and the ranges of the dimensions of the species encountered as weeds in England are not well separated.

The typical carbonized grain of *Avena* is slender, round in cross-section with the apex bluntly chisel-shaped. Often traces of coarse epidermal hairs are evident; the surface is dull, and frequently a burst occurs in the grain shell closely along the ventral furrow (which is no furrow after carbonization!).

A few detached paleas display remains of the strong oval callus characteristic of wild oat (*A. fatua* L.), and most of the grains are of a size that fits comfortably into the range of that species. There are, on the other hand, quite a few grains of a considerable length which should rather be referred to the cultivated oat (*A. sativa* L.). A length of 7.33 mm, which is the maximum in this category, is not impossible in *A. fatua*, but it has not been established for carbonized finds consisting exclusively of that species, while it is a reasonable size for *A. sativa*. The bulk of the *Avena* grains are, however, very much smaller so that it may be concluded that whichever species is being dealt with, they occurred as untended stragglers in the cultivated corn.

The *Bromus* fruits also occur in the palealess state and again this makes it difficult, not to say impossible, to affix a specific name to them. Their size and shape would justify the assumption that it is rye brome (*B. secalinus* L.), but since so many other components of this find are of foreign origin it would have been desirable to have had paleas and rachillas on which to base the final judgment.

The fresh *Bromus* caryopsis is thin, flat, or longitudinally folded; from the semicircular apex the sharp flanks converge rather stiffly towards the pointed embryo. Through carbonization it most often becomes more or less puffed, but the apex and embryo usually keep their characteristics. Further, the hairless epidermis is more or less glossy and frequently the large cells of the testa are plainly visible at a magnification of some 50 times.

It is typical of these two grasses that, like the other weeds, very few of them have sprouted; indeed, only the largest *Avena* grains show traces of sprouts, none of which is preserved.

Additionally, two fruits of rye grass (*Lolium perenne* L.) were found. They are rather badly preserved, 2.67–3.17 mm long, and 1.08 mm wide.

Leguminous weeds

In the identification of seeds of the genera *Vicia* and *Lathyrus* the correlation between overall size and the dimensions and shape of the hilum is the principal criterion. In many species the diameter may vary by a factor of two while the hilum varies comparatively little in length, and not at all in shape. In the evaluation of the seed dimensions given below it should be taken into account that the seed coat is most often wholly or partly lacking, that seeds of this group shrink unevenly on carbonization, and that the cotyledons are apt to burst so that sometimes the maximum dimension may exceed that of the fresh seed. They almost always lose the hilum, and then identification is precarious when only one specimen is available. The Isca seeds are unusual in so far as they have this part preserved in nine out of ten species and the tenth, *L. cicera*, is so characteristic that even in the stripped state it does not leave much room for mistakes.

Altogether 104 seeds of this family were encountered. In this context we shall consider

all of them as weeds although two species, horsebean and lentil, are domesticated plants, because there is no evidence of their having been intentionally added to the corn.

Horsebean (*Vicia faba* L. var. *minor*), one seed and two fragments. The dimensions of the whole specimen are: length 5.75 mm, width (parallel to the plane of the cotyledons) 4.17 mm, thickness 3.33 mm; hilum 2.67 × 0.83 mm. This seed is much leaner than those found in the Early Iron Age sites of Meare and Glastonbury in Somerset (Helbaek, 1952, p. 221), in which the width and thickness were nearly equivalent. This is, however, natural enough if the Isca bean grew untended among the corn.

Hairy tare (*V. hirsuta* (L.) S. F. Gray), one half seed, 2.33 mm in diameter with a narrow, linear hilum of 1.58 mm.

Smooth tare (*V. tetrasperma* (L.) Schreb.), twenty-four whole or fragmentary seeds, seed coats often lacking. Diameter 1.33–2.33 mm; hilum, wedge-shaped, 1.17 × 0.42 mm.

Tufted vetch (*V. cracca* L.), one seed, 3.17 mm in diameter; hilum, parallel-sided, 2.42 × 0.42 mm.

Common vetch (*V. sativa* L.), three seeds varying in diameter from 3.08 to 3.58 mm; hilum wedge-shaped and 1.75 × 0.50 mm; seed coats lacking.

Narrow-leaved vetch (*V. angustifolia* Roth.), fourteen seeds, 2.25–2.83 mm in diameter with a wedge-shaped hilum of 1.67 × 0.50 mm.

Lentil (*Lens esculenta* Moench), about forty whole or fragmentary seeds varying in diameter from 2.50 to 3.84 mm, mean 3.00 mm. The hilum is acutely lanceolate, 0.83 × 0.33 mm.

Yellow vetchling (*Lathyrus aphaca* L.), six seeds, some of them laterally compressed with one rather truncate end at the edge of which is the widely oval hilum, 0.75 × 0.50 mm. The seeds vary in maximum dimension from 2.58 to 3.00 mm and like the horsebean, they are pretty badly filled out.

Grass vetchling (*L. nissolia* L.), eleven seeds, mostly truncate at one or both ends, sometimes short, barrel-shaped. The thick seed coat is coarsely warted or tuberculate, a character that may even be reflected in the surface of the stripped and carbonized cotyledons. The seeds vary from 2.00 to 2.42 mm; the oval hilum is 0.75 × 0.42 mm.

Grass pea (*L. cicera* L.), one coatless seed, 3.67 mm long, 4.00 mm wide and 2.75 mm thick, angular and bluntly wedge-shaped; the hilum is lacking. Whether this is in fact *L. cicera* or its domesticated offshoot *L. sativus* is difficult to decide. The seeds are the same shape and only in modern crops is the size conspicuously greater than in the weed.

Other weeds

Black bindweed (*Polygonum convolvulus* L.), one whole and two broken achenes, 2.42 × 1.92 mm. These fruits are trigonous and pointed at both ends; the blunt edges are smooth, otherwise the carpels are minutely warted.

Curled dock (*Rumex crispus* L.), two trigonous, glossy achenes, 2.17 mm long and 1.33 mm wide, with sharp edges and the style end drawn out slightly longer than the base.

White charlock (*Raphanus raphanistrum* L.), three whole siliqua joints and twelve fragments. The joints are longitudinally ribbed because the surface always burns off. One base joint is 2.50 mm long and 3.42 mm wide, and two upper joints are 3.17 and 3.33 mm long and 2.08 and 2.33 mm wide. Because of its comparatively tender seed coat the highly oleaginous seed of this species is inclined to burn out of all recognition when the joints burst at carbonization, therefore, it was not possible, in this case, to single out any seeds belonging to the joints.

Corn cockle (*Agrostemma githago* L.), one seed, 3.08×2.75 mm. The thick, coarsely tubercled seed coat forms a blunt bulge above the micropyle.

DISCUSSION

Cereals and weeds

Hulled and naked six-row barley were staple crops in Britain from time immemorial. They were introduced with the first agriculture, and the hulled variety increased at the expense of naked barley until, about the beginning of the Christian era, the latter was eventually given up (Helbaek, 1952, Fig. 3). While it must be allowed that barley was grown in bulk in Britain at large, even during the Roman period, it is an odd fact that it never occurs in finds of Roman grain in anything but insignificant proportions. This must be an effect of the 'cultural filter', but as yet we are at a loss for a factual explanation.

The principal wheat species during early prehistory was emmer, but in the course of the third and second centuries B.C. the Celtic tribes who came over from the continent, e.g. the Belgae, introduced spelt and, in southern England, this cereal became predominant among wheats long before the Romans arrived (Helbaek, 1952, p. 210). The earliest spelt known occurs in Switzerland and northern Italy shortly after 2000 B.C. From this area it seems to have spread over most parts of Europe and it appeared during the first millennium B.C. in Rome, Alsace, England and Denmark; in the following millennium it is found in Sweden (Gotland) and Lithuania.

Although it may be taken for granted that the bulk of the food required by the Roman legions in Britain was supplied by the native population as tax-in-kind (*annona*), it seems psychologically feasible that individual soldiers brought back from leave samples of the corn grown at their family farm in Italy or southern Gaul, in an attempt to produce beer and polenta of the same attractive properties as at home. Such seed corn would quickly degenerate and in a few generations turn out exactly as the local British product. But the imported corn would have left its stamp of origin: its foreign weeds.

Some of these species would survive the harsh climate of their new home, and thus a permanent addition to the English flora was secured. This probably applies to *Lathyrus aphaca* and *L. nissolia* which are still found in southern England although, in consequence of their susceptibility to frost, they may lead a somewhat uneasy existence. Others like lentil and *L. cicera* would perhaps hang on for one or two generations, but would eventually be killed off by the first severe winter.

Whereas the five vetches are members of the spontaneous flora of Britain, the above-mentioned four species belong to the milder climate of the Mediterranean and southern Europe, where the lentil is much cultivated and the three vetchlings are very common weeds. In this sample they constitute more than one-quarter of all the non-domesticated leguminous weeds, and that is a most unusual picture. It may be that the lentil represents the pathetic outcome of a serious attempt at introducing the plant as a crop in England, but since the species commonly occurs as a minor admixture to ancient Mediterranean and Near Eastern corn, it may also be that its occurrence in the seed corn was accidental. At any rate, this is the only example of lentil appearing in England. The same applies to *L. cicera*, which is a regular weed in pulse fields in the south.

Horsebean was grown by certain Early Iron Age tribes in Somerset (Helbaek, 1952, p. 211), but it was a far from universal Iron Age crop plant, and nothing indicates that it was grown or utilized by the Romans in Britain. At Isca, like at Verulamium (Helbaek, 1952, p. 213, footnote 3), it appears as an accidental admixture, and again it may well be of foreign origin.

Rye cannot be proved for this find, but I am convinced that a fairly large part of the deposit belongs to this species. Besides a conspicuous approximation to the morphology of rye in many of the distorted grains, among the weeds two species are found which were typical followers of this crop in its advance towards the north, viz. *Agrostemma githago* and *Raphanus raphanistrum* (Helbaek, 1954, 1958). They are not recorded for pre-Roman England, and there is no doubt that the introduction of rye is due to the Romans. There are, indeed, three finds of this cereal in grain of the Early Iron Age (Helbaek, 1952, List B), but in these cases one or two grains only were encountered among large amounts of spelt and barley. On the other hand, the largest and best Roman grain find hitherto is that from Verulamium, and here rye makes up a very considerable proportion (Helbaek, 1952, p. 213). It is well known that the Romans carried rye from the countries which excelled in this cereal, i.e. Germany and northern Gaul, to mountainous parts of their empire, such as Sicily and Anatolia, so presumably they found some quality in the species which suited their taste. Rye has the advantage of being very easily threshed, and the English climate was suitable to it.

The copious admixture of the two main weed grasses is a feature already met with in corn of the Early Iron Age; Fifield Bavant affords the most outstanding example. Whether or not this condition prevailed in even earlier English cornfields is not known for sure, but it seems significant that imprints of these species are not recorded among the grain imprints of times prior to the Iron Age (Helbaek, 1952, List A), but that brome grass and various oats appear in strength in all reasonably large finds in which spelt is involved (Helbaek, 1952, List B). It seems reasonable to conclude that they, so to speak, belonged to the English field when the Romans arrived, and that they would take possession among whatever crop was sown.

The Romans did more, in a short time, in the way of spreading agricultural products over huge areas than anybody else up to the period of Islamic movements in the seventh and eighth centuries. Grain trade was an essential prerequisite to the preservation and expansion of their political power, and acquired dietary preferences were catered for by moving favoured crop plants from one part of the empire to the other, presumably in many cases on individual initiative. With the cultivated plants they spread the weeds. There are many weed species the spread of which is not known in detail, but, if there were many finds like the Isca grain, it would no doubt be possible to pin down the introduction of a large group of northern weeds, from the south, as the direct, or indirect, consequence of the movements of the Roman legions.

Brewing

Besides divulging a strange weed flora, however, the Isca grain affords the first opportunity to consider brewing in ancient Britain. Generally speaking, unsown grain may sprout for one of two reasons: either as a consequence of bad storage, a leaky roof and a soggy floor; or because germination was induced intentionally for the purpose of malting.

It is impossible now to judge in detail the state of the hut in which the grain was kept, but the lengths of such sprouts as are preserved show that the germination did not last more than a few days. The fact that both wheat and rye were alive indicates that none of the cereals could have been dried artificially (Helbaek, 1952, p. 213), which was the normal procedure with spelt in those days, except if it was meant for seed corn or malt. Threshing of spelt had to be preceded by kiln-drying because the tough spikelets do not come apart by simple beating of the fresh spike; the solid parts must be rendered brittle

before they can be crushed and so release the grains (Helbaek, 1952, p. 232). The many spikelet parts found in the grain indicate that the spelt was not threshed.

Brewing is performed in two stages: the malting, and the fermentation. The living grain is dealt with in malting, while in fermentation the grain, as an organism, is killed. The first stage only is relevant to this find.

The conversion of the main substance of the grain, the starch, is brought about by stimulation of the natural germination; by generous administration of moisture and fresh air, and moderate heat, germination is started. During the process an enzyme, diastase, is developed in the grain which converts the starch into fermentable sugars. After a few days the germination is discontinued and the germ is killed by mild roasting.

Thus, at Isca is found a situation that may be interpreted as the end of the malting when the roasting (probably with straw as fuel) got out of hand and the hut was set ablaze. The fact that the corn was not barley should not act as a deterrent to this view, since wheat was widely employed in brewing of '*prima*' quality beer in the ancient Orient (Lutz*, 1922) as well as in the southern Roman provinces (Duval, 1952). In the Orient it was emmer that was used, while spelt must have been the chief malting wheat in the European areas—such as Gaul—where it had superseded the former.

Germinated grain does not often appear in ancient deposits; people were normally more careful with this vital commodity than the quartermaster at Verulamium. Apart from one Danish Iron Age example (Helbaek, 1938), I have never seen a find so convincingly suggesting the initial operation of brewing.

REFERENCES

ANONYMOUS (1959). Roman Britain in 1958. I. Sites explored. II. Inscriptions. *J. Roman Stud.*, **49**, 102.
BOON, G. C. (1962). *Isca, a Guide.* National Museum of Wales, Cardiff.
DUVAL, P. M. (1952). *La Vie Quotidienne en Gaul pendant la Paix Romaine,* pp. 122–3, 346. Hachette, Paris.
HELBAEK, H. (1938). Planteavl [French summary]. *Aarb. Nord. Oldk. Hist.*, (1938), 216–26 and Fig. 90.
HELBAEK, H. (1952). Early crops in southern England. *Proc. Prehist. Soc., Lond.*, **18**, 194.
HELBAEK, H. (1954). Prehistoric food plants and weeds in Denmark. *Danm. Geol. Unders.*, **R.80**, 250.
HELBAEK, H. (1957). Bornholm plant economy. In O. Klindt-Jensen: Bornholm i Folkevandringstiden. *Nat. Mus. Skrft. St. Ber.*, **2**, 262.
HELBAEK, H. (1958). The Oxbøl grain. *Acta Archaeol.*, **29**, 155.
LUTZ, H. F. (1922). *Viticulture and Brewing in the Ancient Orient,* p. 72 ff. Leipzig.

* Unfortunately Lutz, like most other writers on the ancient Orient, consistently uses the name 'spelt', but this was a utility translation since *Triticum spelta* never existed in Egypt or Mesopotamia. In both areas, emmer was the only, or principal, wheat until the emergence of the free threshing tetraploid species about the birth of Christ.