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Plant Impressions in Bronze Age Pottery from Yemen Arab Republic

by Lorenzo Costantini

Introduction

Systematic research carried out on plant remains found in the archaeological levels of various sites in the Yemen Arab Republic was begun in 1983, as part of the programmes of the Italian Archaeological Mission of IsMEO. After preliminary experiments designed mainly to evaluate action and the amount of plant material likely to be recovered from the archaeological layers, a programme was implemented which, in its initial stages, called for the recovery, analysis and study of all the ceramic material bearing plant impressions. It was decided to use pottery in view of the difficulties involved in working satisfactorily with soil samples and because of the possibility of obtaining immediate information from the potsherds. Of course, the decision did not exclude the recovery of soil samples and burnt remains, mainly from the vicinity of fireplaces. It meant only that the latter was secondary to the main line of investigating pottery fragments.

The intensive research work carried out by the Italian Archaeological Mission in the region of Ḥawlān at-Tiyāl ([1]), situated to the south-west of the capital between the Ṣan'ā'-Mā'rib and Ṣan'ā'-Damār roads, led to the discovery of complex settlement areas that C14 dating has placed between the late Neolithic and the Sabaean Period. The great importance of this discovery for our knowledge of prehistoric Yemen induced us to make a preliminary presentation of the results obtained from the palaeoethnobotanical investigations.

Materials, methods and results

The material examined is extremely fragmentary. Although, from the archaeological standpoint, this can give rise to problems and doubts concerning

([1]) de Maigret A. 1982, Ricerche archeologiche italiane nella Repubblica Araba Yemenita. Notizia di una seconda ricognizione (1981), *Oriens Antiquus,* 21, pp. 237-243.

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the attribution and definition of vascular forms, from the palaeoethnobotanical point of view it actually means that a larger number of fracture surfaces can be observed. It is indeed upon the fracture surfaces that the investigation was mainly focused because the pottery usually had a smooth inner surface, while the outer surface was rough and irregular, mainly because of the inclusion of quite coarse material in the outer wall (2). Very often the traces left by the 'scraping' of the included material has disturbed and deformed the small number of impressions visible on the outer surface of the potsherds.

The impressions were identified by analysing their morphological and biometrical characteristics and silicone resin casts made of them. In one particularly lucky case the impression actually contained the burnt plant fragment from which it had originated, thus allowing a more precise analysis and a more definite determination to be made. The problem of the impressions consists in recognizing, from a negative and fragmentary image, something we are normally accustomed to observing in a positive and well preserved form. The fragmentary nature of the image, due to the threshing undergone by cereals, is often aggravated by the cracking of the surface preserving the image and by the presence of large inclusions.

The material examined in the preliminary stages of the investigation came from the site of Wādī Yanā'im (*WYi*), Al-Masannah (*MASi*) and Wādī al-'Iš (*WUiv*).

The site of *WYi* (3), discovered in 1981, is situated half way between Ṣan'ā' and Mā'rib, near the *wādī* of the same name, at a height of about 2000 m a.s.l.. Dated as 3700 ± 80 B.P. (4) on the basis of C14 determinations carried out on burnt house post fragments (5), the site has yielded a significant amount of archaeological evidence, in particular numerous grindstones and mullers (6). Inspection of about 300 potsherds for the purpose of finding plant impressions yielded 20 impressions of barley, sorghum, millet, oats and cumin.

The presence of *Hordeum vulgare* is documented on five different potsherds, by four partial grain impressions and by two impressions of rachis segments. One of the four grain impressions is rather small and thin while the other three come from large, well-developed grains (fig. 1a, b). While there

(2) For a preliminary classification of the typologies and vase forms of the pottery on which the search for the plant impressions occurred, see in this volume: de Maigret A., *A Bronze Age for Southern Arabia.*

(3) See de Maigret A. 1982, *op. cit.*, p. 243.

(4) The dating (T 5730) was carried out by the Dating Radiological Laboratory of the Norwegian Institute of Technology of Trondheim.

(5) The xylotomic analysis of several fragments of charcoal used for C14 dating showed that the burn posts in LI were made of *Acacia* wood.

(6) See de Maigret A. 1984, *op. cit.*, p. 101.

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are no doubs about the identification of the barley impressions, a number of reservations must be made concerning the identification of the impressions referred to *Sorghum* sp. (fig. 1c) and *Panicum miliaceum* (fig. 1d). In both cases, we are dealing with two similar impressions of grains that, in the case of sorghum, are structurally related. The doubts arising over the identification of the sorghum are due not so much to its morphology, which is fairly easy to match with the typical morphology of the species even when it lacks certain features, as to its maximum size, which amounts to about 6.3 mm in length and 4.2 mm in width. These impressions were perhaps produced by larger than average size seeds, as has been demonstrated by using larger seeds of several samples of present-day sorghum from the Sudan. These seeds, which can reach a length of about 5.2 mm, can produce impressions similar to those found at *WYi*. The evidence concerning *Avena*, found on two potsherds, is more clear-cut (fig. 1e), while two seed impressions of *Cuminum cyminum* (fig. 1f), identified by the typical ribbing, are included among numerous other uncertain and yet to be determined impressions on a small fragment of rim ([7]).

The other site investigated from the palaeoethnobotanical point of view is that of *MASi* ([8]), also situated at a height of about 2000 m a.s.l., about 60 Km south of the capital, on the Ṣan'ā'-Ḏamār road. Two dates, each based on fireplace charcoal, are available for this site, 3970 ± 80 B.P. and 3890 ± 80 B.P. ([9]). Chronologically speaking, the *MASi* datings precede those of *WYi*, although on the basis of the analysis of the artefacts and the settlement structure, the two sites can be assigned to the same cultural phase. The search for plant impressions, carried out on a smaller number of potsherds, led to the identification of barley and wheat impressions. As at *WYi*, barley is the best documented species owing to the presence of a grain impression (fig. 2a), of the same size as those found at *WYi* (see tab. 2), and six impressions of rachis fragments (figs. 2b, c, d). In one of these impressions, a burnt rachis fragment was found *in situ*. A further two rachis segments, each consisting of two connected internodes, can be attributed to *Triticum* (figs. 2e, f), although it is not possible to confirm whether the impressions belong to tetraploid or haploid wheat ([10]). On the other hand, the simultaneous presence of species

([7]) The search for impressions, carried out at low magnification using a stereo-microscope, not only involved the fracture surfaces but, as in the case of this fragment, it was necessary to break the fragments further in order to isolate and analyse the impressions located in the thickness of the pottery.

([8]) The site of Al-Masannah was excavated in 1983, under the direction of A. Zarattini.

([9]) Also these datings (T 5196, 5197) were carried out by the Dating Radiological Laboratory of Trondheim.

([10]) The impressions of rachis segments of wheat and barely were found on the same fragment.

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from the two genetic groups is attested at the site of Wādī al-'Iš, which can be assigned to the same cultural phase ([11]). In the pottery found on this site, situated on the same ecological strip as *WYi* and *MASi*, and located some 40 Km south of *MASi*, two grain impressions of similar morphology and size to *Triticum dicoccum* (fig. 3a) and *Triticum aestivum* (fig. 3b) have been found.

Considerations

These palaeoethnobotanical analyses, carried out in the framework of the study of the cultural models and population processes being conducted by the Italian Archaeological Mission on the southeast highlands of the Yemen Arab Republic, are part of the broader and more general problem related to our knowledge, and the distribution of the plants on which the farm economy of protohistoric Yemen was based. In fact, our only previous knowledge came from the short, concise notes left by Pliny on the Kingdom of Saba, which he described as an extremely fertile country, abounding in woodlands and all other sources of wealth ([12]).

Wheat, barley and sorghum were the main representative crops cultivated in ancient times, as is attested by the impressions found in the three sites investigated, and are perhaps indicative of a continuity of farming practice and the exploitation of these plants from the Third Millennium B.C. down to the present time. For the time being, however, no comparisons are available at the local level, although evidence of a similar association of cereals has been found at the site of Hili 8, on the Oman Peninsula ([13]). Situated as it is in an ecosystem of oases, i.e. in an area quite different from the Yemen highlands, the site of Hili 8 has yielded impressions and burnt seeds of *Triticum, Hordeum* and *Sorghum*, together with burnt stones of *Phoenix* and *Ziziphus* from the phase E levels dated as 2500 B.C..

This preliminary information confirms the importance of Yemen as a small focus of agriculture in the vicinity of the great Arabian desert. Furthermore,

([11]) The site of *WUiv* has not been excavated and the impressions were found on fragments of pottery from surface finds.

([12]) In addition to the description by Pliny (*Naturalis Historia*, VI, 32), the results of the analyses of the impressions found on the pottery at the pre-Islamic site of Haǧar Bin Ḥumayd are also available (Sonderstrom T.R. 1969, Impressions of cereals and other plants of Hajar Bin Ḥumayd, in Van Beek G.W., *Hajar Bin Ḥumeid. Investigations at a Pre-Islamic Site in South Arabia,* pp. 399-407, Baltimore.

([13]) Cleuziou S., Costantini L. 1980, Premiers éléments sur l'agriculture protohistorique de l'Arabie Orientale, *Paleorient,* 6, pp. 245-251, Cleuziou S., Costantini L. 1982, A l'origine des oasis, *La Recherche,* 13 (137) 1180-1182.

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according to Vavilov ([14]), the territories lying above 1600 m a.s.l. form the agroclimatic region of the Arabian mountains, which has similar characteristics to the Ethiopian highlands, where the various crops come to maturity very quickly. The modern theories concerning the centres of origin and spread of cultivated plants include Yemen in the Near Eastern Centre, which groups the entire Near Eastern area and the Arabian peninsula ([15]). However, there does not seem to be enough evidence to justify this aggregation and Yemen is more likely to be part of the primary Ethiopian-Sudanese centre of which, according to Vavilov, the Yemeni mountain region is a separate sub-centre ([16]).

The difficulty involved in acknowledging the role played by Yemen as a centre of origin and spread of cultivated plants is probably due to the lack of data relating to the prehistoric-protohistoric period, which are only now becoming available through the new archaeological research.

([14]) Vavilov N.I. 1957, *World resources of cereals, leguminous seed crops and flax, and their utilization in plant breeding*, p. 182, Moscow.

([15]) Zeven A.C., Zhukovsky P.M. 1975, *Dictionary of cultivated plants and their centres of diversity*, p. 76.

([16]) Vavilov N.I. 1951, *The origin, variation, immunity and breeding of cultivated plants*, Waltham: Chronica Botanica.

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Table 1. List of plant impressions found in the pottery at the sites of Wādī Yanā'im (*WYi*), Al-Masannah (*MASi*) and Wadi al-'Iš (*WUiv*).

	WYi	*MASi*	*WUiv*
Emmer (*Triticum dicoccum*)			1s
Naked wheat (tetraploid/exaploid)		2r	
Bread wheat (*Triticum aestivum*)			1s
Six-row barley (*Hordeum vulgare*)	4s, 2r	1s, 5r	
Sorghum (*Sorghum* sp.)	2s		
Broomcorn millet (*Panicum miliaceum*)	2s		
Oat (*Avena* sp.)	3s		
Cumin (*Cuminum cyminum*)	2s		

(r: rachis fragment; s: seed)

Table 2. Size of plant impressions found in the pottery at the sites of Wādī Yanā'im (*WYi*), Al-Masannah (*MASi*) and Wādī al-'Iš (*WUiv*).

Provenance	Species	L	B	T
WYi. LI, liv. I	*Hordeum vulgare* (s)	8,10	—	2,70
WYi. LI, liv. I	*Hordeum vulgare* (s)	—	3,60	3,00
WYi. LI, g. 2	*Hordeum vulgare* (r)	2,10	1,80	—
WYi. LI3	*Sorghum* sp. (s)	6,30	4,20	—
WYi. L3, liv. I	*Panicum miliaceum* (s)	2,85	1,90	—
WYi. L3, liv. I	*Panicum miliaceum* (s)	2,65	1,61	—
WYi. L3, tram.	*Avena* sp. (s)	4,70	0,90	—
MASi. E8, S1	*Hordeum vulgare* (s)	8,40	2,90	—
MASi. E1, S3	*Hordeum vulgare* (r)	2,55	1,30	—
MASi. E1, S3	*Hordeum vulgare* (r)	1,90	1,70	—
MASi. E1, S3	*Hordeum vulgare* (r)	2,00	1,70	—
MASi. E1, S3	Naked wheat (r)	2,00	—	0,70
MASi. E1, S3	Naked wheat (r)	2,00	—	0,70
MASi. E1, S3	Naked wheat (r)	2,00	1,90	—
WUiv. II	*Triticum dicoccum* (s)	6,05		3,03
WUiv. I	*Triticum aestivum* (s)	5,20	2,90	

(r: rachis fragment; s: seed)

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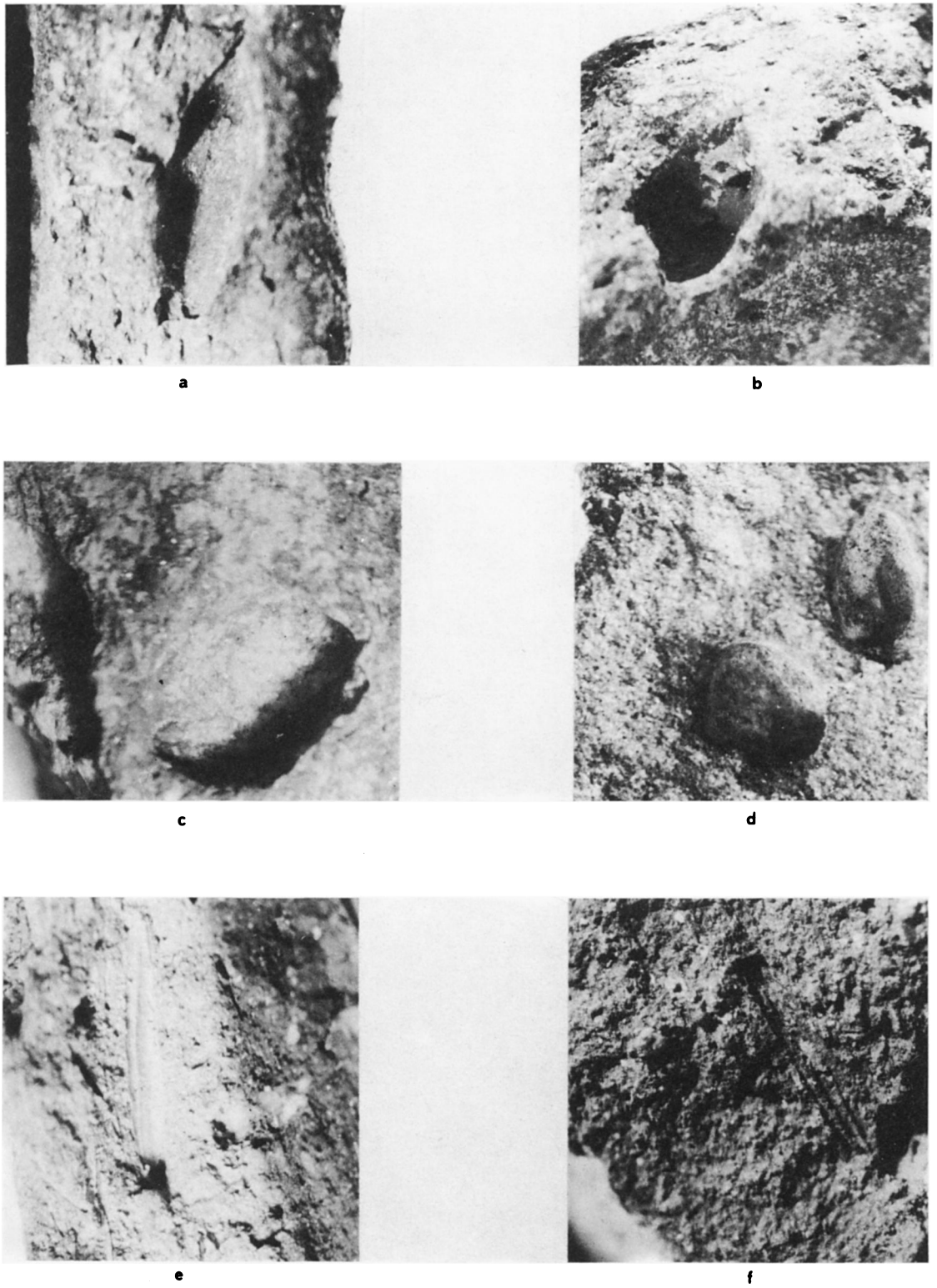

Fig. 1 - Wādī Yanā'im, imprints on potsherds; a: grain of *Hordeum vulgare*; b: grain of *Hordeum vulgare* (section); c: grains of *Sorghum* sp.; d: grains of *Panicum miliaceum*; e: grain of *Avena* sp.; f: seed of *Cuminum cyminum*.

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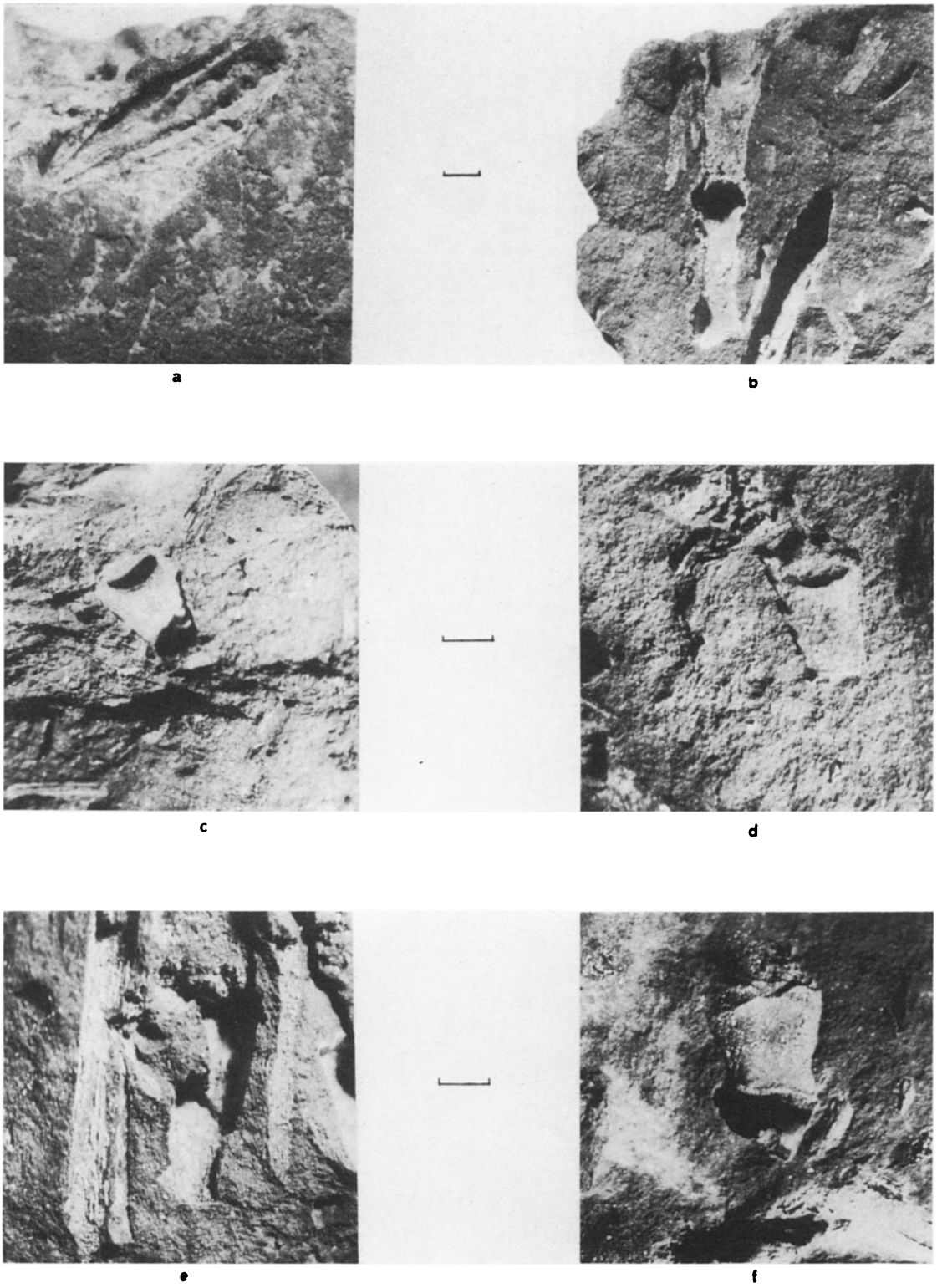

Fig. 2 - Al-Masannah, imprints on potsherds; a: grain of *Hordeum vulgare*; b: two segments of rachis of *Hordeum vulgare*; c: a segment of rachis of *Hordeum vulgare*; d: a segment of rachis of *Hordeum vulgare*; e: two segments of rachis of *Triticum durum/aestivum*; f: two segments of rachis of *Triticum durum/aestivum*.

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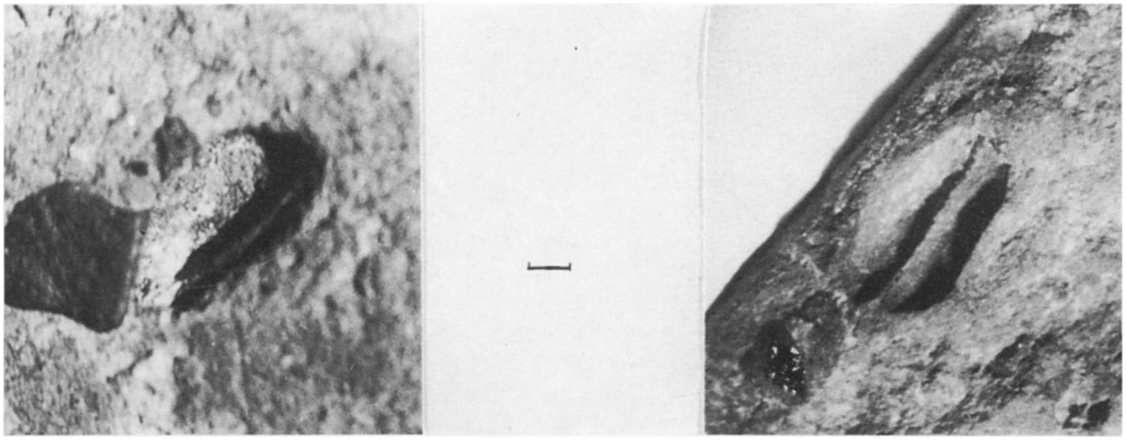

Fig. 3 - Wādī 'Iš, imprints on potsherds; a: grain of *Triticum dicoccum*; b: grain of *Triticum aestivum* s.l.

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