Pact 42 - 4 : Sekina Ayyad and Knut Krzywinski

Archaeopalynological Thoughts on *Vicia faba* Type Pollen from Ancient Mendes (Tel El Roba Area, Egypt)

Abstract

An existing profile 3 meters deep at Tel El Roba (Mendes, capital of the 16th district in lower Egypt, 3000 BC) has been analysed. The samples yielded only one type of pollen (*Vicia faba* type), well preserved, but in varying concentrations. The highest concentration was found at a depth of 215 cm. The assemblage indicates that this type of legume was cultivated in lower Egypt in ancient times, but its contextual significance and its role at Mendes is not obvious. Several possibilities for the origin of *Vicia faba* (broad bean) pollen in this context and the validity of applying palynology to urban archaeology in Egypt are discussed.

Introduction

This pilot study is one of a series discussing palynological methods and Egyptian archaeology. Ayyad *et al.* (1991) point to mudbrick as a bearer of information on Nile Vally agriculture. The use of archaeopalynological investigations of such agricultural residues may be of particular importance in evaluating and mapping large scale cultivation of grain. Archaeopalynological studies of other types of deposits may, moreover, contribute to the understanding of the socio-economic processes, among others the urbanisation process, following the spread of large scale grain cultivation.

Most of our knowledge of Old Kingdom agriculture in Egypt comes from ancient texts and representations. These sources suggest that, from the dawn of recorded history, Egypt was a major source of agricultural produce, particularly of grain. Later Egypt was also a major exporter of grain (Garnsey, 1988), and Herodotus stated that the Delta was the easiest

land to work in the known world (Butzer, 1976). The natural flood plain of the Nile Valley, in ancient times was wide and rich as well as easy to cultivate. The annual flood waters were to some degree predictable (as to time of arrival but not as to level) and were in part possible to control, merely by modifying natural basins to retain the floodwaters for longer periods. It was possible to convert the edges of the Nile floodplain into highly productive agricultural land (Trigger *et al.*, 1983).

In previous studies of ancient agriculture in Egypt emphasis has been laid on the Nile flood and grain production. Only to a limited extent have other agricultural products have been discussed. The main source of information is plant material in the form of grave goods, agriculture depicted in scenes and written records. The gravegoods and pictures give an impression of a varied and somewhat luxurious diet. The contents of graves are thought to reflect the daily needs of this life which the living give the deceased for their comfort in the land in the West which they hopefully will enter (Assmann, 1985; Verhoeven, 1985). The inventory of graves reflects therefore a mode of life probably equal to or better than that which the person had when alive. As the graves are mainly those of the nobility the plant material and other grave goods should not be expected to reflect the life of the population in general.

The relationship between the expansion of agriculture and the emergence of the pharaonic state has been investigated for the Delta, a region which is becoming the object of increasing archaeological exploration (Wenke, 1986). This period of expansion is also the time when large scale architecture in mudbrick makes its appearance in Egypt. It is also the beginning of an urban historical period for which the chronology is fundamentally sound.

The urbanisation process accompanying the growth of the Nile Valley grain economy changed the society and must have had socially as well as ecologically negative effects. The urban centers with dense population spread over the Nile floodplain needed a hinterland to support their economy. This may have caused degradation of the environment. Urbanisation must also have created not only specialized activities in trade and craftmanship but also a new social order. The livelihood of the lower classes outnumbering the nobility is expected to be reflected neither in graves nor in commercial accounts.

Little attention has been paid to the social dualism (the rich and the poor) in Egyptian cultural history. Cultural remains of lower classes are few or lacking due to their perishable nature. However, evidence may be found in pollen samples of cultural deposits from farming and urban sites in the centers now being excavated in the Delta as well as in Upper Egypt.

The site

Tel El Roba is the present ruins of the historical city « Mendes » It is located on the northeastern side of the Nile Delta, about 20 miles east of the Damietta branch, and 70 km south of the present Mediterranean coastline (Fig. 1). It became an important town about 5000 years ago as capital of the 16th district of Lower Egypt. At that time the balance of political power and economic importance seems to have shifted from sites like Hierakonpolis, in the southern Nile Valley, towards the juncture of the Delta and the Nile Valley, and to towns such as Tel El Roba, within the

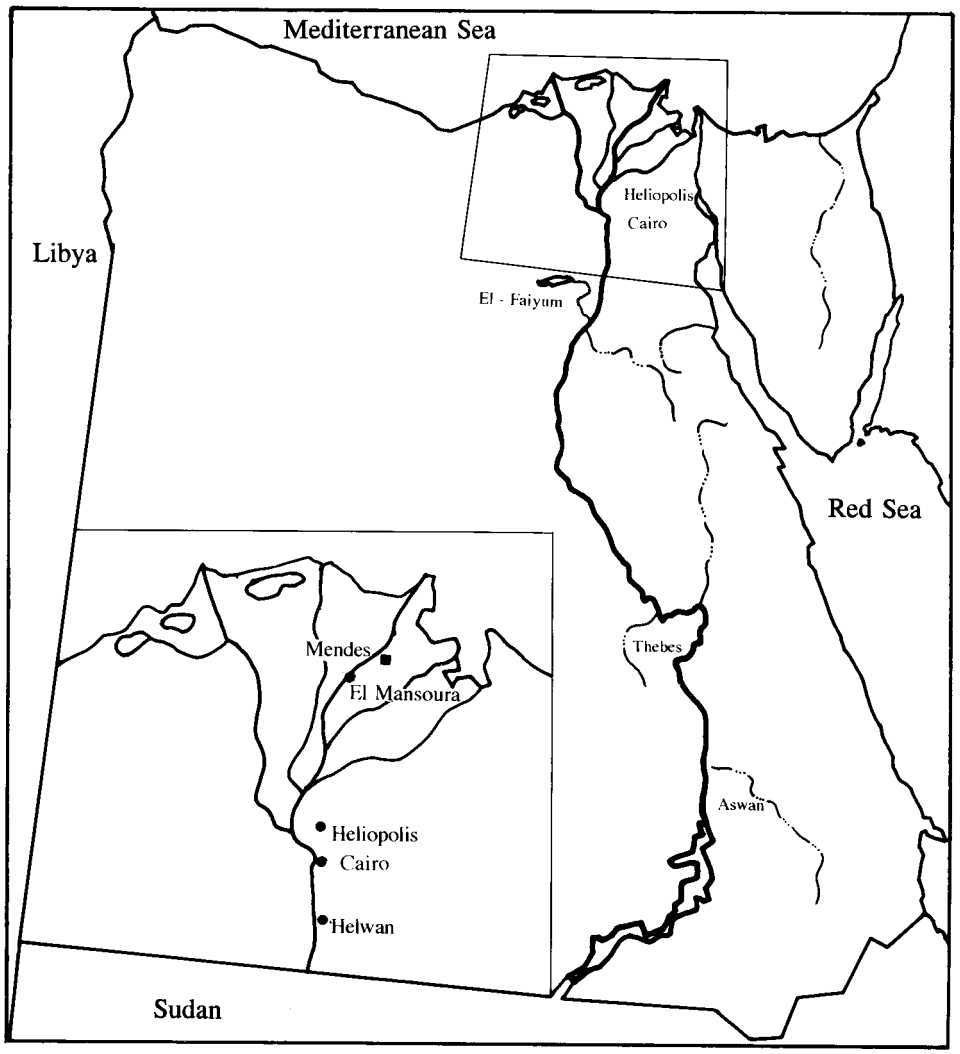

Fig. 1. Survey map of Egypt and the Delta area.

Delta itself.

Beginning in the late third millennium B.C., the Delta became one of the most densely populated and economically most productive areas of Egypt. A particularly important aspect of the Delta was its role as a conduit for Egypt's political and economic relationships with the outside world.

Recent studies have shown that the Delta became one of the most important areas of Egypt between 5000 and 4000 years ago, in the Early Dynastic and Old Kingdom periods (e.g. Van den Brink, 1987; Von der Way, 1987). In antiquity Mendes probably lay on a major branch of the river and was thus connected both to the sea and to the whole of Egypt, via the Nile. Like Buto (Tell El Farain) in the western Delta, Mendes may well have been a major connecting point between Egypt and Asia, via both maritime and overland routes.

In its later periods (Hall and Bothmer, 1980), Mendes was one of the major cities in Egypt, particularly during the Saite and Late periods. The 26th Dynasty pharaohs made it one of their most important cities, building an impressive temple around an open courtyard. Inscribed standing rectangular stone monuments that were part of the temple complex, remained as one of most visible features in Mendes. The first systematic excavations of Old Kingdom and Early Dynastic levels of Mendes were accomplished in three field seasons between 1964 and 1966 (Bothmer and Hall, 1980). These excavations revealed massive deposits dating to the Old Kingdom, with many buildings, several stone tombs, and numerous other features of the Fifth and Sixth Dynasties. At the present excavations are going on in the ancient capital. The study here presented is based on samples collected from one of the excavated areas.

Material and methods

In general, at least in classic pollen analysis, a pollen record represents regional vegetation; while a macrofossil assemblage represents a local catchment. This is due to the infrequent and erratic occurrence and low preservation potential of macro plant material in contrast to the large quantities, good representation and excellent resistance to decay of pollen material. The two approaches complement each other and are important for different aspects and applications of paleoethnobotany.

Macrofossils can generally be identified as belonging to lower taxonomic levels than pollen can and are more directly connected to their actual context than pollen. Nevertheless, classic pollen analyses are more broadly regional and more reliably representative of the species from which they derive; and pollen samples can be retrieved from most types of deposits that receive a general pollen rain.

A hybrid of the two approaches is found in modern archeopalynology the model of which is generally different from that of regional pollen analysis (Faegri and Iversen, 1988). All the pollen that a local flora produces is not dispersed evenly over the surrounding terrain. Large quantities of pollen are associated with plant material from the localities where that pollen is produced. These pollen assemblages are associated with plant material used on and near archaeological sites. Due to resistance to decay and the general nature of production and deposition, fossil pollen material has a better representation, survival capacity, and information value than original plant material (Krzywinski and Soltvedt, 1988; Magid and Krzywinski, 1988). Pollen analyses of cultural deposits at archaeological sites are generally possible even when other archaeobotanical methods fail.

The information content of a pollen recorded is closely connected to its contextual situation. The more information present in the archaeological context and the more samples present in an actual database, the more detailed the information that can be retrieved from a pollen assemblage.

The presence of a pollen type in an archaeological deposit is not in itself particularly interesting. One may conclude very little from this evidence alone. The context information adds greatly to the value.

Pollen samples. The samples for pollen analysis have been taken from an excavated area near to a prominent granite stone monument. The excavation in this area revealed houses with mudbrick walls.

An existing profile 3 m deep, was closen for sampling. The exposed surface of the profile was cleaned carefully with a spatula to avoid contamination. Sampling started at 2 meters depth, due to supposed disturbed soil above. Six soil samples (10 g each) were taken, where the sediment was found to be compact and stratified, according to the change in colour along the profile. The samples were collected in March 1990 and taken to the Botanical Institute of the University of Bergen, Norway, in July 1990 where they were analysed.

Three gram subsamples from each sample were mixed with a known number of marker grains (*Lycopodium* tablets) (Stockmarr, 1971), and the fossil pollen was extracted by monofilament sieving according to the method of Faegri and Iversen (1989) and Moore and Webb (1978). The samples extracted were then mounted on slides; and their fossil pollen, marker grains and charcoal particles were counted.

Light microscope photographs of the well preserved fossil pollen were taken. In order to obtain more details about the fossil pollen, the single grain SEM technique was employed (Magid and Krzywinski, 1988; Faegri and Iversen, 1989, p. 87). Single fossil grains of *Vicia* pollen type were removed from the microscope slides, one by one, using a capillary tube,

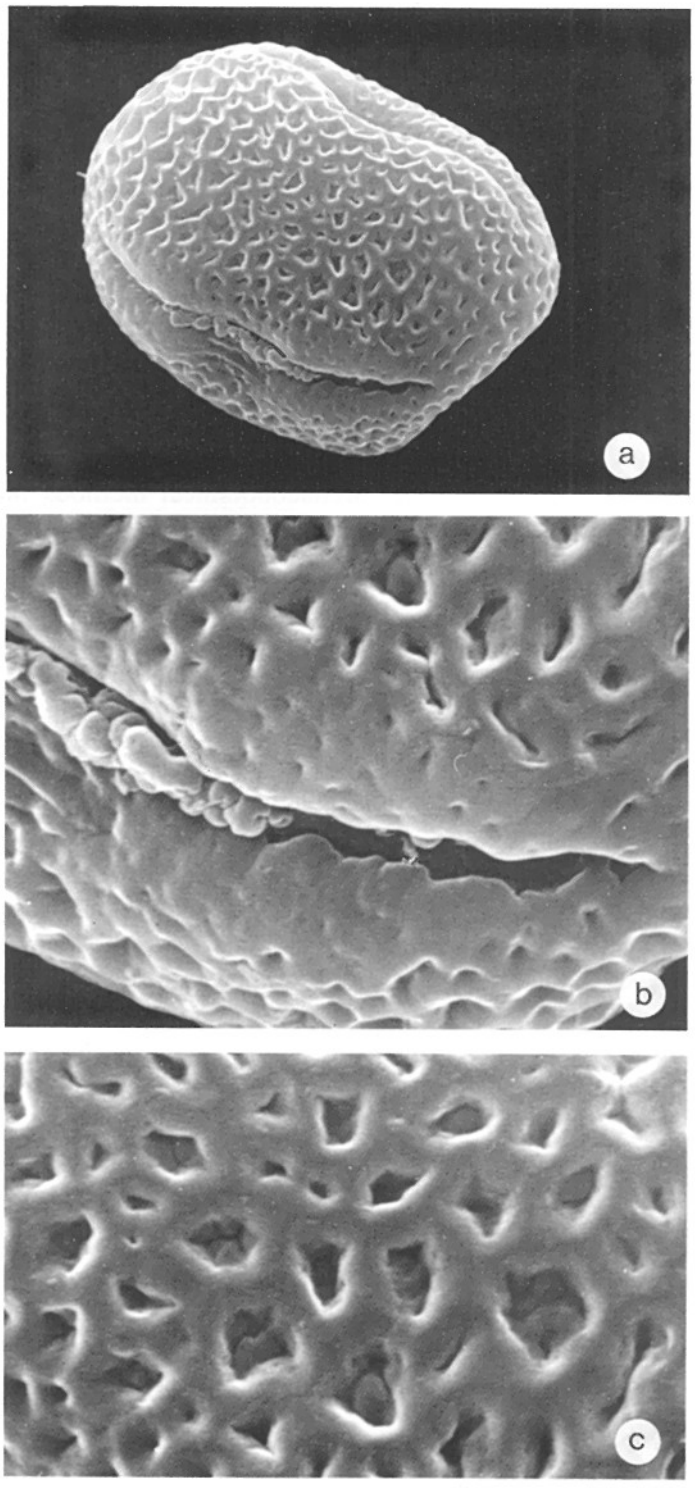

Plate. 1. SEM micrographs of Vicia faba *fossil pollen (size 26 micrometer), (a) Whole pollen grain, (b) Magnified part of the grain showing the aperture, (c) Magnified part of the grain showing the reticulum.*

washed several times in water to remove glycerol, mounted on stubs, freezedryed, sputter coated and photographed using SEM (see Plates 1 and 2). Loss on ignition was measured for the six samples, which were heated at temperature of 500C over night. The percentage of loss on ignition in each sample was calculated. The total number of pollen grains/g organic matter and the total number of charcoal particles/g organic matter were also calculated for the six samples.

Results

The analysis of the samples yielded only one type of pollen grain (*Vicia faba* type) (see plates 1 and 2). Fig. 2 shows the total number of pollen grains per gram organic matter, charcoal particles per gram organic matter and the percentage of the loss on ignition for the six samples of the profile. It has been noticed from fig. 2 that the charcoal particles increased parallel to the increase in the number of pollen grains in the first 4 samples (200 cm, 215 cm, 225 cm and 235 cm). The maximum pollen count was 13087

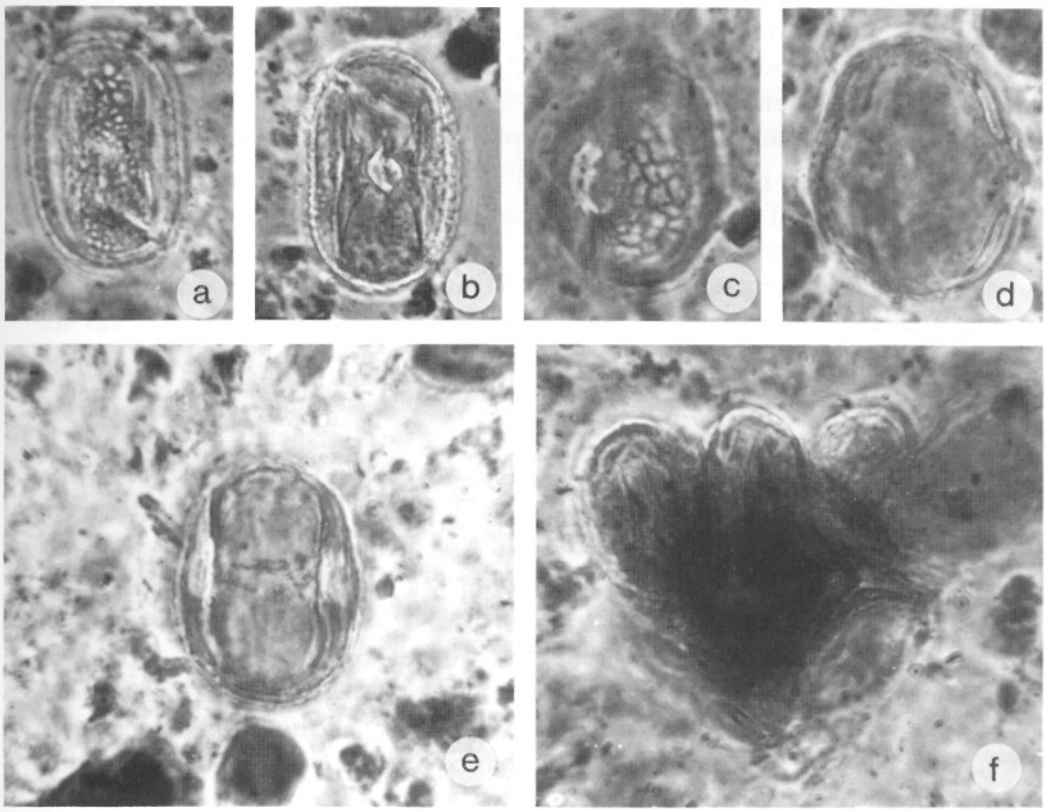

Plate 2. (ae) LM micrographs of Vicia faba *fossil pollen (size 26 micrometer), (f) LM micrographs showing a cluster of grains.*

grains per gram organic matter at 215 cm depth where the charcoal particles were 45682 particles/g organic matter. With the decrease in the pollen content there was a concomitant decrease in the number of charcoal particles. At 235 cm depth, the pollen count was 395 pollen grains/g organic matter, and the number of charcoal particles was 4172 particles/g organic matter. This result is also parallel to the loss on ignition, where the maximum loss on ignition being 10.39 % at 215 cm depth and its minmum value 6.34 % at 235 cm depth.

The two deepest samples at 250 cm and 265 cm depths have no pollen content as shown in fig. 2, while the number of charcoal particles was 18356 particles/g O.M. and 65584 particles/g O.M. respectively, also the loss on ignition being 7.66 % and 7.51 % respectively.

Discussion

In the present case where large quantities of pollen of *Vicia faba* type were found, at first one may conclude only that the broad bean actually was present in Mendes at this time. This conclusion adds very little to the general cultural history of Egypt in general or to that of Mendes in particular. Methodologicaly, however, it is important as it points to a palynological potential in the cultural deposits which have so far not been utilized in the studies of ancient Egypt.

The growing interest in botanical remains from archaeological sites in this region as well as elsewere has mainly been in the macroscopic remains, in particular in carbonized seeds and fruits. The studies conducted so far add valuable information to the already extensive records of Egyptian daily life and economy. However, this archaeobotanical approach alone has its limitations, first of all due to a question of conservation.

Plant remains are at the outset perishable and unless carbonized or fossilized in one way or another their presence is resticted to waterlogged deposits of which the deserts of Egypt have few. An exception to this, to which the palaeobotany of Egypt owes its merit is the conservation of material of botanical origin, e.g. food, found in graves (Täckholm, 1951).

Carbonised plant material found in the cultural deposits of houses and domestic premises, on the other hand, is the product of the activities of those who lived and worked there. If this material had reflected all aspects of daily life, one could also have obtained details about the life of the population in general. As a rule it does not. Carbonization of plant material takes place when the material is subjected to high temperatures in the absence of oxygen (Krzywinski and Soltvedt, 1988). This happens when food accidentally falls into a fireplace, grains are roasted, or plant material is used for fuel. Moens and Wetterstrom (1988) state that the use of animal

dung as fuel may account for most of the carbonized seeds in their material. Generally one can assume that carbonized material only reflects a limited part of activities, even though an important one.

The present finding of *Vicia faba* type pollen in deposits from ancient Mendes is important even though its contextual information is lacking. It documents first of all that pollen is preserved under the prevailing dry conditions at the site.

The pollen content in the different levels of the profile as shown in fig. 2, the charcoal particles and the loss on ignition of the soil samples of the profile are thus important. Further, the purity of the pollen spectra refute a mixed origin, disturbance, or that the presence reflects the general pollen rain.

The following features are to be considered :

1. The presence of a single type of pollen grain in the soil.
2. Absence of associated pollen grains of weeds which grow naturally within the crop in the field.
3. The high record of charcoal particles at this level, which might be accumulated soot from fireplaces or cooking.
4. The high percentage of loss on ignition at that level indicates the highest organic content of the sediment, which may represent the remains of the perished mother plant material.

From this we may state that the pollen assemblage of the soil (*Vicia faba* type) is derived from human activity rather than from random natural dispersion processes such as transportation by wind and water.

Vicia faba pollen type, as shown in plates (1 and 2), has been found in clusters on the slide during counting, which could suggest that the whole crop was deposited in this place. The presence of clusters of pollen indicates that pollen has been transported and deposited in bulk. It is possible that the present find is the remains of *Vicia* legumes (Krzywinski *et al.*, 1983) either in the form of stored food, food preparation residue or faecal deposits. Other possibilties should also be further investigated. Edwin and Brink (1989) have found in their study on the archaeological site, (Tel El Iswid) in northeastern Nile Delta, macrofossils such as seeds belonging to Papilionaceae. Due to the poor preservation of the seeds they categorised (subdivided) those seeds according to their dimensions. Seeds smaller than 2 mm are « *Vicia* small », seeds between 2 and 2.5 mm are just *Vicia*, and those bigger than 2.5 mm are « *Vicia* large ». As it is not clear whether « *Vicia* large » is a wild species with big seeds or a cultivated *Pisum* or *Vicia sativa* which has the same seed dimensions, these species are placed in one group.

In this connection, Moens and Wetterstrom (1988) investigated seeds and other plant remains from the archaeological site at Kom El Hisn in the Western Nile Delta. They found that most of the plant material belongs to : cereal straw, field weeds, reeds, sedges and fodder plants.

The fodder plants represent almost 27 % of the material. *Trifolium* sp., *Vicia* sp. and *Medicago* sp. are commonly cultivated to feed livestock. Moens and Wetterstrom (1988) draw attention to the hand feeding of livestock. Such feeding could in the present case well have been based upon vegetaive residue from bean production. Therefore it is at least possible that the present find was a stable deposit. However, the repeated dominance in subsequent samples is inconsistent with such an origin. The absence of pollen grains of weeds which grow naturally within crops, contradicts an agricultural origin of the layers.

The high concentration of the pollen content of pure *Vicia faba* type at 215 cm depth and the high record of charcoal particles and also the highest loss on ignition at this depth point towards an activity on the site at this level which led to an accumulation of *Vicia faba* residue over time, because it was a place for storing crops or for processing or dumping them.

Vicia faba is used as food in most parts of the word. It is easily grown in small scale vegetable gardens. It is frequently found as carbonized seeds in archaeological contexts, also outside its present cultivation area. *Vicia faba* is at present one of the most important sources of food in the Nile Valley of Sudan and Egypt. Its high nutrient value, its protein content, and its good taste makes « foul » important as the main dish, not only in rural areas but also among the broad urban population. The pollen from Mendes could reflect a similar aspect of the ancient diet.

The present study is a pilot study. If it stimulates the use of archaeo-palynology as an additional tool in the study of Egyptian cultural history, it has served its purpose.

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