

# Pollen analysis from the resin used for embalming a mummy from the Roman period of I century AC Museu Nacional (MN/UFRJ), Brazil

Sérgio A. de Miranda Chaves<sup>1</sup>; Antonio Brancaglioni Jr.<sup>2</sup>

<sup>1</sup> Escola Nacional de Saúde Pública (ENSP)- Rio de Janeiro/RJ - Cep 21040 900

<sup>2</sup> Museu Nacional - Universidade Federal do Rio de Janeiro (UFRJ) - Rio de Janeiro/RJ

KEY WORDS: pollen analysis, ancient plants, mummy conservation, pollen grains, palynology.

## Abstract

**Human embalming was practiced widely by the Egyptians using resins extracted from shrubs, trees, or by the use of propolis – also known as bee’s glue. These resins that formed from terpenic derivatives, retain a variety of remains: the epidermis of plants, grains of sand, pieces of coal, and grains of pollen. Pollen analyses were made on a mummy belonging to the Egyptian collection of the Museu Nacional: the “Singer of the Temple of Amon”, dated around 750 AD. This is a rare mummy from the Roman period because the limbs were buried separate from the body. We can find only seven mummies buried in this way in the European collections. Our results expand our knowledge about the use of plants which were given as offering or presented at the moment of burial, as indicated by pollen grains through the time.**

Human embalming was largely used by the Egyptians, either using various resins extracted from shrubs, from trees, and by using “propolis” collected by the bees. Inside such resins – formed from terpenic derivatives – various remains are concealed. These remains include epidermis of plants, sand grains, fragments of coal and pollen grains. Pollen analyses were conducted on a mummy belonging to the Egyptian collection from the Museu Nacional, dated approximately 750 AC. This mummy from the Roman period is a very rare find. Our results expand our knowledge about the use of plants which were offered or were present at the moment of burial as represented by pollen grains through the time.

## Introduction

Pollen analysis was largely used in archaeology to reconstruct the paleoenvironment at prehistory (Leroi-

Gourhan and Renault-Miskovsky, 1977) and at the time of ancient civilizations (Roubet and Desroches-Noblecourt, 1985). (Chaves and Reinhard, 2003; Chaves and Reinhard (in press) and Chaves and Renault-Miskovsky, 1996a.) found plants with a medicinal use. (Dickson, et al. 2000) shows additional data about the use of food among our ancestors. Paleopharmacology is the study of medicinal remains from archaeological sites (Reinhard et al. 1991; Chaves and Reinhard 2003). The theoretical foundation for the field is Ortiz’s (1975) study of Aztec medicinal plants identified in an historical codex. To the Quaternary, the records of pollen research from resins samples are still rare (Vernet and Leroi-Gourhan, 1969; De Franceschi, et al 2000). Human embalming was largely carried out by the Egyptians, either starting from various shrubs resins or trees resins, and, for example, the propolis collected by the bees. Such moist resins are of natural terpenic derivatives, and as such usually contained various debris, like sheets of plants, sand grains, fragments of coals and even pollens grains. The majority of the objects belonging to the Egyptian collection from the Museu Nacional (MN/UFRJ) arrived in Brazil in 1825. The emperor Dom Pedro I was interested in Archaeology. His son, Dom Pedro II also interested in Archeology and Eastern philosophy, traveled to the Egypt two times. This mummy from the Roman period (I century A. C.) belongs to the area of Thebes and is rare due its preparation.

## Methodology

Two resin samples were taken from the external part of the mummy classified with the number 158. It is a female mummy belonging to the collection from the Museu Nacional/UFRJ. Two samples were collected from the inside, at a well preserved area of the sarcophagus, with the intention to investigate the pollen load of the air at this time, the plants used in embalming or other intentional deposits. The samples were taken on the level of the lower limbs, under their feet. The pollen analysis was conducted on a small part (1cm?) of these resinous remains. The method of extraction of pollen was developed with the aim to observe and identify by an optical microscopy. The methodology involves dissolving the resin in acetone. The volume used for the preparation of the samples was 1cm?

We left the resin in acetone during three days, for a total dissolution and, afterwards, we rinsed it with water and glycerin solution (50% each one). The pollen grains concealed in this solution were then ready for analysis and identification.

## Results

Our results confirm that the pollen grains of these two samples consist to a high percentage (63%) of plants linked with the family Asteraceae – Inuleae tribe (*Helicrysum* sp.) (Tab. 1). This shows the selective of these flowers. We considered the possibility reheat these plants at this time.

Genres	Percentage
<i>Helicrysum</i> sp.	67%
<i>Pistacia</i>	5,6%
Caryophyllaceae	4,7%
<i>Cassia italica</i>	8,0%
Asteraceae2	7,5%
Liliaceae	1,8%
<i>Terminalia</i> sp. 1,8%	
Poaceae 1,8%	
Arecaceae 0,94%	
<i>Euphorbia</i> sp. 0,94%	

Table 1 - Pollen percentage expressions for the pollen grains found at the resin sample.

Tree pollen is only in a low representation throughout the sample, but it should be noted that *Cassia italica* and *Terminalia* sp. have a large distribution at Eastern Africa. The Asteraceae family presents inflorescences in flowerheads. The flowers, hemarphroditic or polygamous, are joined together on a receptacle encircled with bracts. Each flower includes a calyx adhering to the ovary, the corolla gamopetal, regular or irregular, five welded cheese cloths with anthers, a plain-ovary giving a naked akene or to brush (Roubet and Desroches-Noblecourt, 1985). Asteraceae are plants which are comprised of many genera. The distinction on the genus level was possible due to the extraordinary good level of preservation of the the pollen conserving pertinent features for identification. The pollen grains show the typical multiple round-offs, with three apertures, tri-colporate appearance and roughcast small spines (Fig. 1a). Due to the preservation of the floral part of the ray, we could also confirm the presence of pollen of the tribe Inuleae (standard pollinic *Helicrysum* sp.) (Fig. 1b). We suggest the use of this plant might have either been connected to a special homage to the mummy, or in a more profane explanation, might have been used as binder during the embalming process. According Roubet and Desroches-Noblecourt (1985), Asteraceae have insecticidal properties and certain genres were known since earliest Antiquity. Wild

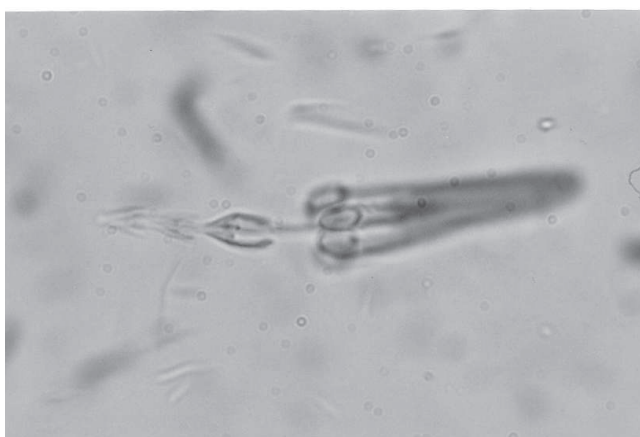
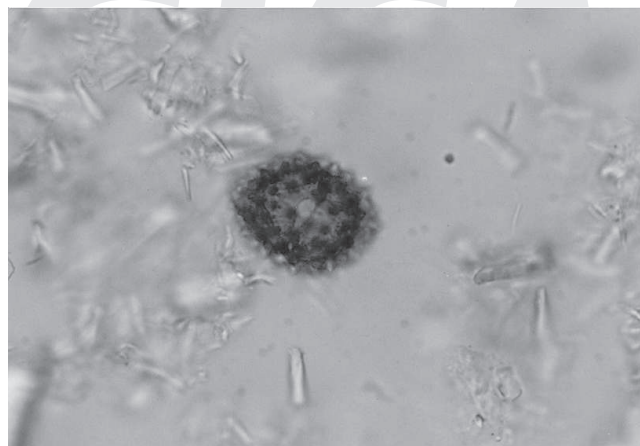


Fig. 1a, 1b - Type *Helicrysum* sp. (equatorial view) and part of a flower 400X - 1000X.

or cultivated these Asteraceae are a witness of a selective plant use.

Other pollen grains found are from the tree genus *Pistacia* sp. with a percentage (5,6%). According to Roubet and Desroches-Noblecourt (1985), the presence of this pollen grain in predynastic Egyptian mummies attests the use of this tree in High Egypt, used especially like a resinous exudation and add to manipulate perfumes. Probably these plants are from the Middle-East, more precisely from Eastern Africa. We also identified others remains like fibrous vegetal remains, epidermis and others structures. Our analysis showed that some plants were selected to be used in the embalming process. Additionally, our results made it possible to identify the geographical origin of the mummy. Different elements and plants remains are present in resins and gums. According to Roubet and Desroches-Noblecourt (1985), potential medicinal plant genera found in different mummy samples had a conservation or a medicinal application. For some genera such as *Lowsonia*, *Cinnamomum*, and *Pistacia* have medicinal value.

We hope that the palynology resin research will be able to improve the environmental reconstruction in the future, generate news scenarios for others Egyptians civilizations and improve our knowledge on the care, the use of the plants in embalming.

## Acknowledgements

Special thanks to Dr. Karl Reinhard responsible for the official presentation at the V Mummy Congress Torino, Italy, August 2004 and Katharina Dittman for text review and suggestions.

## Literature Cited

- Chaves SAM, and Reinhard KJ. (in press) Critical Analysis of Coprolite Evidence of Medicinal Plant Use, Piauí, Brazil, Special issue on "Advances in the interpretation of pollen and spores in coprolites" Owen K Davis (Ed) *Palaeogeog, Palaeoclimat, Palaeoecol.*
- Chaves SAM, and Reinhard KJ. 2003. Paleopharmacology and Pollen: Theory, Method and Application. *Mem. Inst. Oswaldo Cruz* 98, 207-211.
- Chaves SAM, and Renault-Miskovsky J. 1996. Paléoethnologie, Paléoenvironnement et Paléoclimatologie au Piauí, Brésil: apport de l'étude pollinique de coprolithes humains recueillis dans le gisement préhistorique Pléistocène de «Pedra Furada». *C. R. Acad. Sci. Paris* t. 322, série IIa: 1053-1060.
- De Franceschi D, Dejaz J, and De Ploeg G. 2000. Extraction du pollen inclus dans l'ambre (Sparnacien du Quesnoy (Oise), Bassin de Paris): vers une nouvelle spécialité de la paléopalynologie. *C. R. Acad. Sci. Paris* serie IIa 330: 227-233.
- Dickson J, et al. 2000. The omnivorous Tyrolean Iceman: colon contents (meat, cereals, pollen, moss, whipworm) and stable isotope analysis. *Philosophical Transaction of the Royal Society of London* 355, 1843 – 1849.
- Leroi-Gourhan A, and Renault-Miskovsky J. 1977. La Palynologie appliquée à l'Arqueologie. Approche écologique de l'Homme fossile. Méthodes, limites et résultats, *Supplem. au Bull. de l'A.F.E.Q.*, 47: 35 – 49.
- Ortiz de Montellano B. 1975. Empirical Aztec medicine. *Science* 188: 215-220.
- Roubet C, and Desroches-Noblecourt C. (Eds.) 1985. La Momie de Ramsès II: Contribution Scientifique à l'Égyptologie (Paris: Éditions Recherche sur les Civilisations) 331p.
- Vernet JL, and Leroi-Gourhan A. 1969. Étude Botanique de résines de l'étang de Manguio (Hérault), *Annales de la Société d'Horticulture et d'Histoire Naturelle de l'Hérault* 109:32-36.