The identification of wood used for two Fayum mummy portraits from the Art Institute of Chicago, 1922.4798 and 1922.4799

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Introduction

In line with recommended protocols, two tiny samples of wood from mummy portraits 1922.4798 and 1922.4799 in the collections of the Art Institute of Chicago were submitted to the author for species identification. Sampling was carried out in unobtrusive areas that were free from insect damage, pigments, binding media, and conservation consolidant or adhesive, so that the fine details of the cellular structure were visible for characterisation.

Following a major exhibition in 1997 “Ancient Faces”, identification of the woods used for Roman period mummy portraits has been carried out in the Department of Scientific Research at the British Museum (Cartwright 1997a and b; Bierbrier et al. 1997; Cartwright and Middleton 2008; Cartwright et al. 2011; Cartwright 2011; Cartwright 2015). This research continues today on mummy portraits from other international collections, as part of the APPEAR (Ancient Panel Painting: Examination, Analysis, and Research) project, in order to document the extent to which wood properties such as grain, strength, durability and workability were understood and sought after by craftsmen, woodworkers and artists in ancient Egypt.

Methods

In compliance with standard protocols of the International Association of Wood Anatomists (IAWA), each mummy portrait wood sample was sub-divided into transverse (TS), radial longitudinal (RLS) and tangential longitudinal sections (TLS) in order to examine all the anatomical features (Cartwright et al. 2011; Wheeler et al.1989). As the mummy portrait wood is desiccated, friable and fragile, the best method for this was to carefully fracture across the TS and along the RLS and TLS rather than thin sectioning (Cartwright 2015). Each sub-divided wood sample was then placed uncoated on an adhesive carbon disc mounted onto an aluminium SEM stub; no other sample preparation was required. Examination of the mounted wood samples and comparative reference specimens was undertaken in the Hitachi S-3700N variable pressure scanning electron microscope (VP SEM) using the backscatter electron (BSE) detector at 15 kV. Magnifications ranged from x100 to x800. The preferred working distance was *c.*12 mm, but was extended to 15.2 mm (as required). As the samples were in variable conditions of preservation, the SEM chamber was only partially evacuated (40 Pa). With the BSE detector, 3D mode (rather than Compositional) was preferentially selected to maximize the opportunity to reveal diagnostic features for identification The Oxford Instruments energy-dispersive X-ray spectroscopy (EDX) analyser attached to the SEM was used to provide elemental identification and semi-quantitative compositional information where necessary e.g. to determine whether crystals and inclusions were calcium oxalate or silica.

Results and Discussion

The wood of mummy portrait of a man, 1922.4798 (2nd century AD) was identified as *Tilia europaea*, European lime/linden tree. The wood from this particular mummy portrait was in very good condition, Figure 1. The wood of mummy portrait of a man, 1922.4799 (2nd century AD) was also identified as *Tilia europaea*, European lime/linden tree, although the condition of this wood was less good, Figure 2.

The identifications of *Tilia europaea* were made on the basis of recognition of the following anatomical features: distinct growth rings; diffuse porous arrangement of vessels in clusters; angular solitary vessel outline; polygonal alternate intervessel pits; vessel-ray pits with distinct borders; similar to intervessel pits in size and shape throughout the ray cell; simple perforation plates; distinct spiral (helical) thickenings in the vessels; non-septate thin- to thick-walled fibres; fibres with simple to minutely-bordered pits; homocellular to heterocellular rays generally between 2 – 6 cells wide (sometimes 4 – 10) and often greater than 1 mm high; diffuse apotracheal axial parenchyma distributed in tangentially-orientated uniseriate bands (diffuse-in-aggregates), or marginal bands. In-house reference collection specimens of *Tilia* species woods were consulted for comparison.

At the outset of the wood identification programme (Cartwright 1997a and b) it rapidly became clear that a high proportion of the mummy portraits were made on imported European lime wood, *Tilia europaea*. At the time (1997) these results provided new, fresh information. As the research programme has progressed, it is even more important to acknowledge that the wood anatomy evidence continues to testify to this overwhelming trend for selecting imported European lime wood for mummy portrait panels (Cartwright et al. 2011; Cartwright 2015). This has had a significant impact on the interpretation of cultural influences associated with Roman period mummy portraiture in Egypt. Three principal species of *Tilia* have been recorded in Europe: *Tilia europaea* (which, at the present day, exists in its hybrid form *Tilia* x *europaea*), *T. cordata* (small-leaved lime/linden), and *T. platyphyllos* (large-leaved lime/linden). As these are indistinguishable one from another on the basis of their wood anatomy, the decision has been taken to attribute the mummy portrait wood identifications to *Tilia europaea*, as a generic term for European lime trees. Importantly, *Tilia* is not native to Egypt, and lime wood must have been imported into Egypt, although whether this import was in the form of raw timber, or prepared panels, or even finished mummy portraits, remains to be established.

Although some pollen grains from Mediterranean trees not native to Egypt such as *Alnus* sp., alder, *Corylus* sp., hazel, *Pinus* sp., pine and *Quercus* sp., oak have occasionally been found in fossil and recent sequences from the Nile delta and desert oases, it has been concluded that such pollen has been transported considerable distances from southern Europe by wind (Zahran and Willis 2009; 306). Current research still suggests that there were insufficient vegetational and climatic differences (compared with today) for *Tilia* species to be grown as an indigenous tree in Egypt at the time in which mummy portraits were in use, or even in the preceding periods (Cartwright 1997a).

The properties of lime wood for the woodworker and carpenter have long been recognised (Cartwright 1997a). With its fine and uniform texture, and good strength-to-weight characteristics, it is one of the most suitable wood species for hand carving as it is easy to work. Split down the radial plane, it has provided ideal thin panels for mummy portraits, with an even finished surface. It can be steam-bent if required, and resists splitting when being worked. By the Middles Ages in Europe, lime wood was very popular for intricately-carved religious statuary, becoming known as the carver's tree, which is a testament to the quality of its properties. It is of great interest, therefore, that these properties were already very familiar to the creators of Roman period mummy portraits found in Egypt.

Conclusions

The way in which people, clothes, jewellery and hairstyles were depicted on the mummy portraits shows that in Roman period Egypt there was a fashion for funerary portraiture that echoed Greek and Roman traditions in the Mediterranean region. The fact that this extends also to the choice of woods used for the portrait panels themselves, notably for imported European lime wood, continues to fascinate the scholarly world.

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Figure 1

Variable pressure scanning electron microscope backscatter image of a radial longitudinal section of *Tilia europaea* lime wood from mummy portrait 1922.4798, showing the distinctive helical thickenings present in the vessels. The scale bar is in microns (micrometres). Image: Caroline Cartwright; copyright The Trustees of the British Museum.

Figure 2

Variable pressure scanning electron microscope backscatter image of a radial longitudinal section of *Tilia europaea* lime wood from mummy portrait 1922.4799, showing that although this wood is in a more friable condition than 1922.4798, nonetheless the distinctive helical thickenings are clearly visible in the vessels. The scale bar is in microns (micrometres). Image: Caroline Cartwright; copyright The Trustees of the British Museum.