WOODEN REMAINS FOUND AT DASKYLEION AND THEIR ANATOMICAL EXAMINATION

DASKYLEİON'DA BULUNAN AHŞAP KALINTILAR VE ANATOMİK İNCELEMELERİ

Makale Bilgisi | **Article Info**

Başvuru: 27 Şubat 2022 | Received: February 27, 2022
Hakem Değerlendirmesi: 09 Mart 2022 | Peer Review: March 09, 2022
Kabul: 19 Nisan 2022 | Accepted: April 19, 2022

DOI : 10.22520/tubaar2022.30.003

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ABSTRACT

The wooden remains found in T6 and T7 tumuli and "Three-Room Building" complex of Acrodaskyleion are the subject of the study. These samples were found in the sockets of copper alloy arrowheads in T6 Tumulus. Also, another sample was found in a bullet covered tenon on a marble block in the T7 Tumulus. According to the anatomical examinations on the wooden specimens, the arrows made from poplar/willow.

The wooden specimen found in the tenon belongs to the black pine, the genera/species identified are the common trees in the region. Black pine is the main forest tree, which have a wide natural distribution area, and poplar/willow grow through the rivers in the region. As conclusion, the types of wood processed were selected according to its function. The tenon was made by black pine which is more resistant to external deteriorations. The wooden part of the arrows is made of low density and flexible poplar/willow wood.

Keywords: Daskyleion, tumulus, wood, anatomical examination, building material.

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DOI: 10.22520/tubaar.2022.30.003

ÖZET

Daskyleion İlk Çağ Kenti'nde T6 ile T7 Tümülüsleri'nde ve Akrodaskyleion'da Üç Odalı Yapı'da ele geçen ahşap kalıntılar bu çalışmanın konusunu oluşturmaktadır. Bu örnekler, T6 Tümülüsü'nde ve Akrodaskyleion'da Üç Odalı Yapı'da ele geçen ok uçlarının kovanlarında korunmuş ahşap kalıntılar ve T7 Tümülüsü'nde mermer bir blokta görülen, üzeri kurşun kaplı ahşap zıvanadır. Örnek alınan ahşap parçalar üzerinde yapılan anatomik incelemede, okların kavak/söğüt ağacından üretildikleri, diğer zıvanadan alınan ahşap örneğin ise karaçam türüne ait olduğu belirlenmiştir. Tanımlanan ağaç cins ve türleri bölgede yaygın olarak bulunan ağaçlar olup karaçam geniş alanlar kaplayan bir orman ağacı iken kavak/söğüt akarsu kenarlarında yetişen ağaçlardır. Sonuç olarak kullanılan ahşabın türünün işlevine göre bilinçli olarak seçildiği anlaşılmaktadır. Zıvana yapımında dış ortam şartlarında bozulmalara karşı daha dayanıklı olan karaçam kullanılmıştır. Okların ahşap kısmı ise yoğunluğu düşük ve esnek yapılı kavak/söğüt ağacından üretilmiştir.

Anahtar Kelimeler: Daskyleion, tümülüs, ahşap, anatomik teşhis, yapı malzemesi.

Figur 1. T6 Tumulus / *T6 Tümülüsü*

INTRODUCTION

Turkey has many archaeological excavation areas from different time periods. Wooden materials found from these excavations produced important information to understand wood use in the historical times.[1] For instance, juniper woods were used in Necropolis of Juliopolis[2], Scots pine was used in n Tumuli at Gordion[3], and different woods from some excavations[4] in Turkey. These findings revealed that humans were used the nearest woods to their settlements.

In 2010, several wooden pieces uncovered in T4 Tumulus at Daskyleion. These pieces probably belong to various ancient furniture and personal items. Especially, pieces of a kline, a wooden bow and an eventual umbrella deserve attention among these wooden goods. An anatomical examination, made on these pieces recently, determined types of woods used to produce items.[5]

Wooden finds subjected here were unearthed in T6, T7 tumuli and "Three-Room Building" complex of Acrodaskyleion. Sort of trees and the functions of the artifacts are the main concentration points of this paper. The contribution of tree selection to the function has been investigated. Although C14 and dendrochronology method are important in the dating of wooden finds, these methods were not needed for the woods examined in this study, because these wooden pieces were found together with quite well dated pottery.

Figur 2. Leaded Bronze Arrowheads from T6 Tumulus (Examples 1 and 2) / *T6 Tümülüsü'nden kurşunlu tunç ok uçları (Örnek 1 ve 2)*

1 Akkemik *et al.*, 2019; Akkemik and Genç, 2016; Akkemik, 2015; Akkemik and Metin, 2011; Blanchette and Simpson, 1992; Kayacık and Aytuğ, 1968.
2 Akkemik and Metin, 2011.
3 Kayacık and Aytuğ, 1968.
4 Şanlı, 1988, 1989.
5 Yaman *et al.* 2014, 174-184.

DOI: 10.22520/tubaar.2022.30.003

Figur 3. Iron Arrowhead from Three Room Building in the Acrodaskyleion / *Akrodaskyleion Üç Odalı Yapı'dan demir ok ucu*

DETERMINATION OF EXAMPLES

EXAMPLE 1 AND 2

In 2012, 91 arrowheads were found in the grave chamber of T6 Tumulus (Figure 1).[6] At the same time, the bronze gorytos ornament was uncovered with the arrowheads. Thus; it is understood that the arrowheads were left in a gorytos to the grave.[7] Small pieces of wood were detected inside the socket of the arrowheads (Figure 2). The best preserved wood sample is 1 cm long and 0,5 cm thick.

EXAMPLE 3

In the Acrodaskyleion, a complex called a "Three-Room Building" is unearthed, which shows an uninterrupted construction from the Phrygian/Mysian Period through Persian period. An iron arrowhead found stuck in the trench section during the work in campaign of 2021 in the Room B of this building (Figure 3).[8]

EXAMPLE 4

The Daskyleion excavations team worked the T7 tumulus where placed in the Southern Necropolis at Daskyleion in the campaign of 2017 (Figure 4).[9] During the excavation, they uncovered two monolithic blocks (Figure 5-6). These blocks were displaced by treasure hunters. Two tenons which are measured 10x10 cm were settled at the one of sides of the block. That wooden tenons are covered with lead. During the campaign of 2012, this building technique was also examined at the blocks in T6 tumulus at Daskyleion. However, the wood was not preserved in the lead at the blocks in the T6 Tumulus (Figure 7).

METHOD

The examples numbered 2 and 3, which are from arrowheads, were very small with about 2-2,5 mm in diameter. Thin sections from these woods were taken by using a sharp razor blade. Thin sections from the example 1 were taken by using the LEICA Microtome. Three thin sections, transversal, tangential and radial sections from each example were taken and all identification studies performed on these sections.

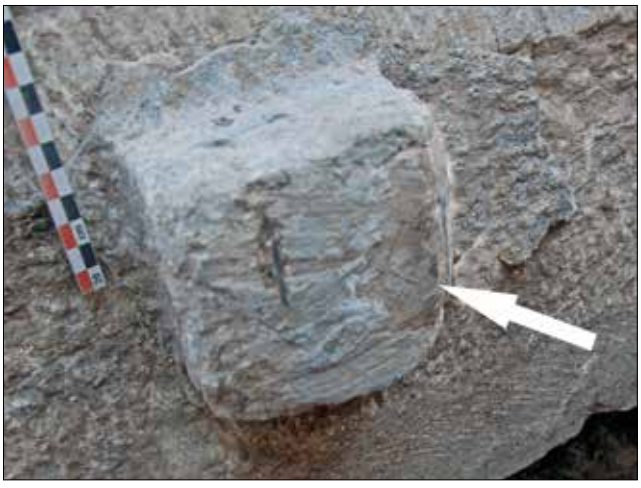
The related references[10] and reference wood sections in the Department of Forest Botany of Faculty of Forestry, Istanbul University-Cerrahpasa were used in identifications, and followed IAWA microscopic features for hardwood identifications[11] and softwood

6 Kasar 2021: 143-145; Kasar 2020.
7 Kasar 2021:138-141; Kasar 2018, 57-71.
8 Kasar 2021: 160-161.
9 İren *et al.* 2019: 6-7.
10 Akkemik and Yaman, 2012; Schweingruber, 1988.
11 Richter *et al*., 2004.

Figur 4. T7 Tumulus and two monolithic blocks / *T7 Tümülüsü ve iki yekpare blok*

DATING

When the excavation begins, it was understood that the T7 Tumulus was looted by treasure hunters. A lydion base was uncovered at a block during the fieldwork in 2017 (Figure 8). According to Greenewalt, this lydion is an early example and dates to the second half of the 6th century BC.[13] However, the same form of wooden tenon (Example 4) with by covered lead in the T7 was also used in the T6 Tumulus as a building technique which was used between 470-420 BC with the Attic pottery found in the burial chamber. Furthermore, the arrowheads and their wooden remains was also unearthed in T6 Tumulus (Examples 1 and 2). The arrow found in the Three Room Building is dated between the late 6th century BC and the early 5th century BC (Example 3).



Figures 5-6. Monolithic blocks and wooden tenon is covered with lead from T7 Tumulus / *T7 Tümülüsü'ndeki yekpare bloklar ve ahşap üzerine kurşun kaplı zıvana*

Figur 7. Two wooden tenons are covered with lead on the monolithic block from T6 Tumulus / *T6 Tümülüsü'ndeki yekpare blok üzerinde kurşun kaplı ahşap zıvanalar*

identification.[12] In the analysis a LEICA Light Microscope with a LEICA Camera were used and photos of the woods were taken.

RESEARCH FINDINGS AND DISCUSSION

Identification results showed that examples 1, 2 and 3 are belonging to *Salix* (willow) or *Populus* (poplar). Because of being very small pieces, differences between willow and poplar could not be observed. In transversal sections wood clearly diffuse porous, transition from early wood to the latewood is unclear. Axial parenchyma may be seen only in the borders of tree-rings. Vessels are circular, ovate, and angular. In tangential section, rays were observed as uniseriate. In radial section rays both homogenous and heterogeneous (Figure 9). There is a small difference between poplar and willow woods, which is rays homocellular in poplar and heterocellular with one row of upright or squared cells in rays of willow wood.[14] Because of being too small pieces of woods this difference could not be observed, and therefore identification was given as poplar/willow.

[12] Wheeler *et al.*, 1989

[13] Greenewalt 1968, 147-148, pl. 2, fig. 3; Greenewalt 1966, pl. 1.

[14] Akkemik and Yaman, 2012; Schweingruber, 1988.

DOI: 10.22520/tubaar.2022.30.003

Figur 8. Lydian base from T7 Tumulus / *T7 Tümülüsü'nden lydion kaidesi*

Different cultures were used different woods in production of arrowheads. For example, in Ottomans, pine wood was widely preferred in arrowhead production.[15] The identification here in this study is rather different and can be concluded that human was used the nearest appropriate wood as arrowhead. In Balıkesir, many different tree species grow such as elm, ash, linden, oak, poplar, willow, maple. The reason of poplar or willow use can be lightness and flexibility of the woods.[16]

Poplar and willow are common among the tree species chosen for making arrows and shields in ancient times. Especially willow or poplar wood was used in the heart of the shield, composite bow and the arrow body.[17] These woods densities are so much lower than the density of oak or pine wood.[18] Poplar was lighter and willow wood tended to shrink a bit in case of puncture.[19] These trees are in a structure that absorbs the shock rather than breaking in a crash.[20] In other words, both trees are flexible and more resistant to any impact than other wood species. Pliny the Elder mentioned the flexible structures of trees growing in wetlands such as poplar and willow.[21] At the same time, light arrows shooted from short composite bows allow the arrow to reach at high speeds over long distances.[22] For this reason, the type of wood chosen is important in making arrows and shields.

The tenon and a mortise connect two materials together as a type of dowel in structural components.[23] The tenons were formed from the metals, like iron or bronze, as well as from the woods during the Iron Age.[24] For the consolidation of the tenon, the lead was poured around the wood. The aim of this, the wood with air was to cut and the contact of the wood with air and to protect it many years. In addition, wood was used as an easily accessible material in the construction technique. Also, the cost of the building has been reduced.

Wooden tenon was used to connect to the column drums of the Temple of Parthenon[25] and Temple of Hephaestos[26] in Athens. Two wooden tenons were found during the consolidation of the eastern façade stairs of the Didyma Temple of Apollo.[27] In Persepolis, wooden tenon was used as the vertical connecting element of the parapets in Apadana by Ionian masons.[28]

According to the identifications about Daskyleion example 4, the wooden tenon was a black pine wood. In its transversal section, tree-ring boundary is distinct, transitions from earlywood to the latewood is mostly abrupt, vertical resin canals common. In tangential section, horizontal resin canals are common in rays. In radial section, rays heterogeneous, ray tracheids with irregularly serrate, and cross-field pits are window-like and wide pinoid (Figure 10). According to the references Schweingruber[29], Akkemik and Yaman[30], this wood described as a piece of a black pine.

It is observed that especially coniferous wood species such as pine and cedar are chosen in the construction of tenon while combining architectural parts.[31] The main reason for choosing these tree species is that coniferous trees can remain intact for a longer period of time in the external environment due to their anatomical features.[32] In addition, the tenons from Daskyleion were also covered with lead to protect them from external influences.

15 Yücel, 2021
16 Khorasani and Dwyer 2016, 59; Stanturf and Oosten 2014, 1.
17 Roy 2022: 51; Whately 2021: 18; Zutterman 2003: 143; Miller et al. 1986: 183.
18 Krentz 2013: 136.
19 Schwartz 2013: 158.
20 Gilbert 2018.
21 Plinius, 16.77.
22 Grayson et al. 2007: 10.
23 Dinsmoor 1922.
24 Durm 1910, 145, fig. 118.
25 Lavano 2019: 90.
26 Guhl *et al.* 1875: 7.
27 Bumke 2020: 24-25.
28 Nylander 1970, 46, fig. 13.
29 Schweingruber 1988.
30 Akkemik and Yaman 2012.
31 Bumke 2020: 24-25; Guhl *et al.* 1875: 7.
32 Bozkurt and Erdin 1997

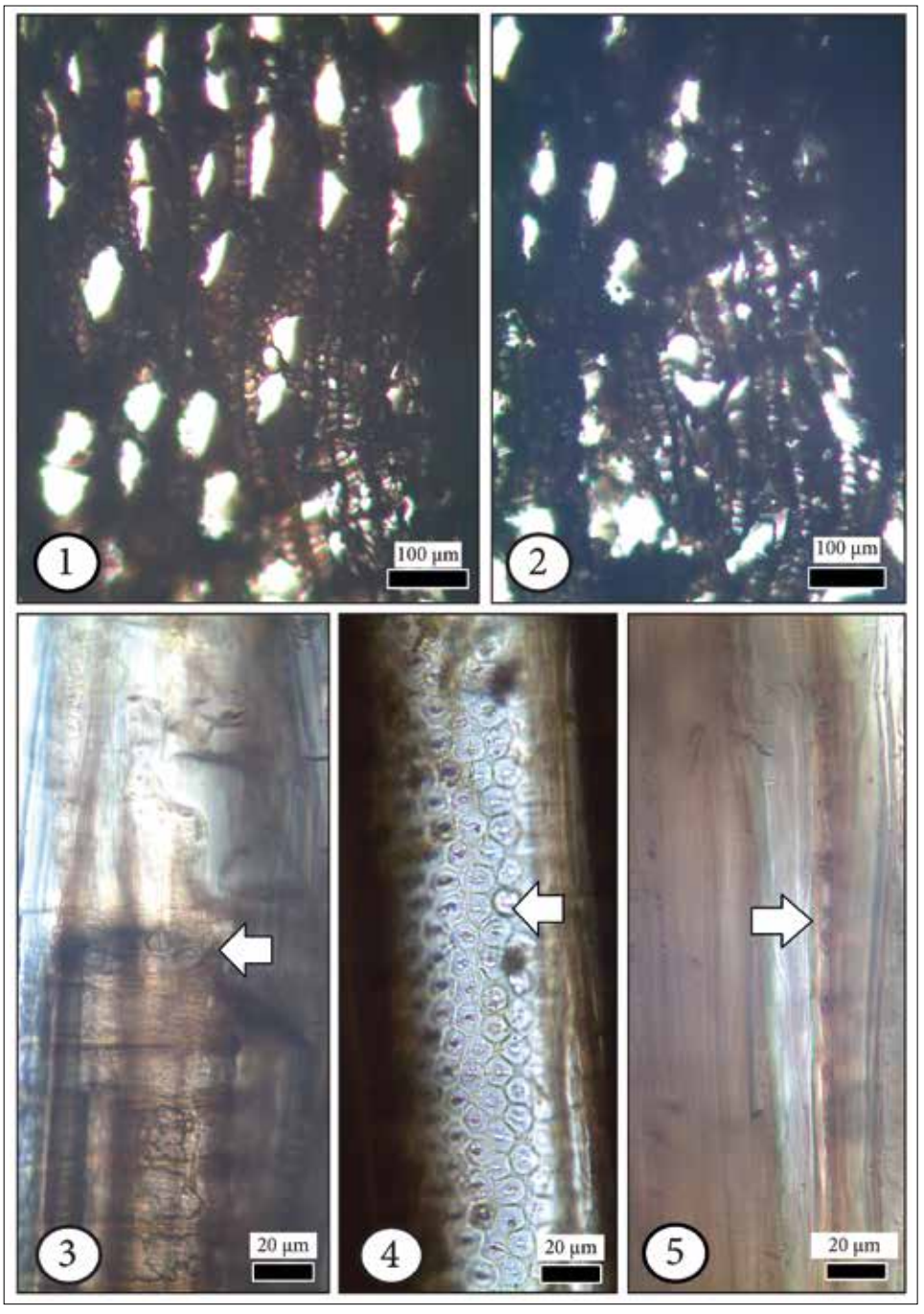


Fig. 9. Wood sections of Salix/Populus (arrows). -1-2) Transversal sections, -3) Special cross-field pits to Salix/Populus, -4) Alternate arranged bordered pits on the radial walls of vessel, -5) Uniseriate ray in the tangential section / *Söğüt/kavak ağaç kesiti (oklar). -1-2) Enine kesit, -3) Kavak/söğüde özel çapraz alan çukurları, -4) Radyal duvarlarda sınırlandırılmış çukurlar, -5) Teğetsel kesitte tek sıralı ışın*

DOI: 10.22520/tubaar.2022.30.003

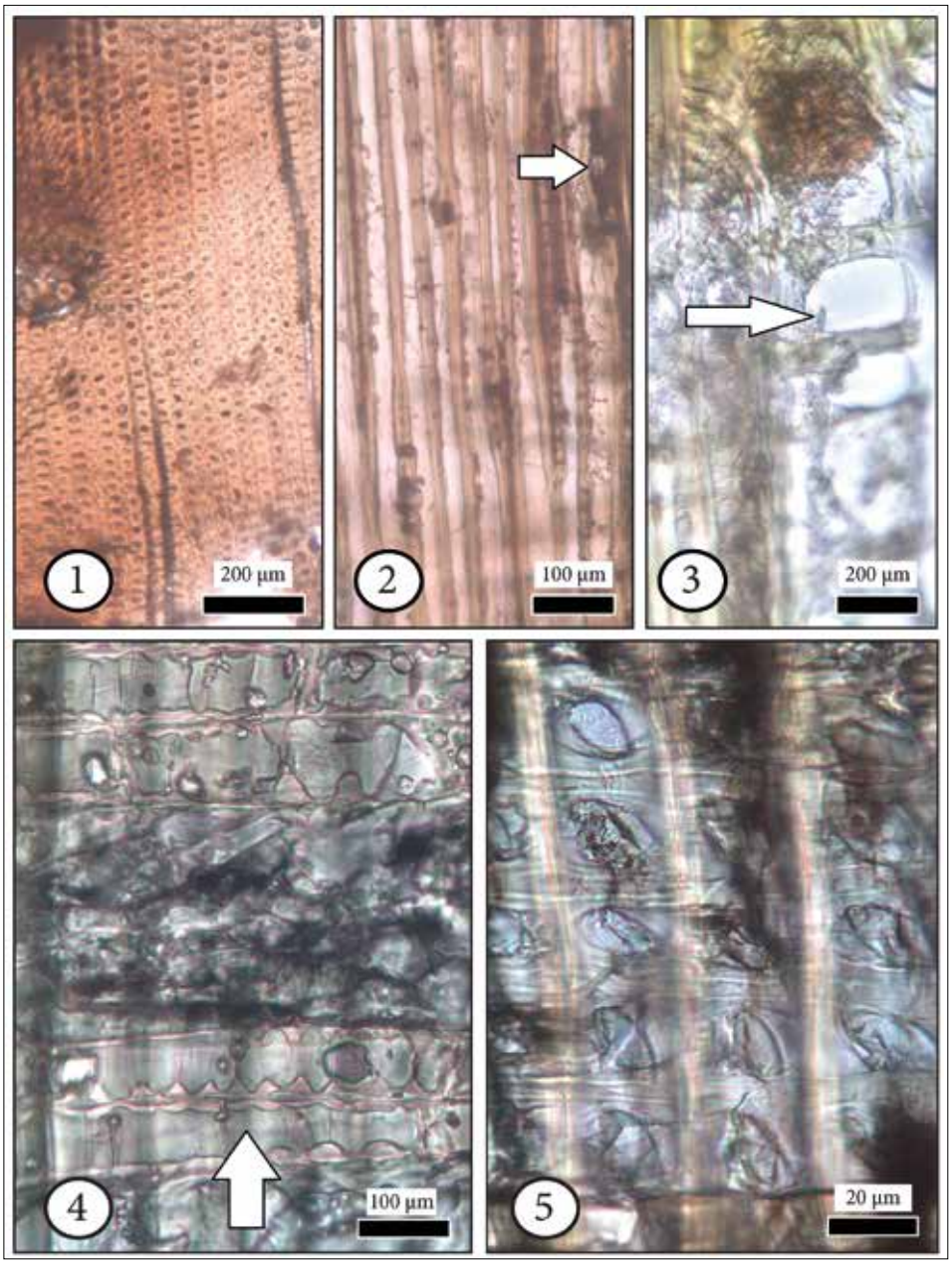


Fig. 10. Wood sections of Pinus nigra (tenon). -1) Transversal section, -2) Tangential section, -3) Window-like cross-field pits, -4) Dentate walls of ray tracheids, -5) Large pinoid type cross-field pits / *Karaçam ağaç kesiti (zıvana). -1) Enine kesit, -2) Teğetsel kesit, -3) Pencere benzeri çapraz alan çukurları, -4) Traheiddeki dişli duvarı, -5) Büyük pinoid tip çapraz alan çukurları*

CONCLUSIONS

As conclusion, the anatomical diagnosis of wooden parts taken from the sockets of the arrowheads has been completed. Although, since these pieces are very small in size, one of two similar tree species must have been used. These tree species are poplar or willow. The reason these tree types for the construction of arrow lays in their especial lightness and flexibility. In addition, the fact that the arrows are made of durable wood such as poplar/ willow suggests that these weapons may have been collected and reused after being used once. So, arrows become more functional through the use of these tree types in producing of the selection of weapons.

It can be said that lead coated wooden tenon was used in Daskyleion as the building technique during the 6th and 5th centuries BC. However, the types of processed wood have been selected according to the objects and their functions. According to the examples examined at Daskyleion, one may suggest that in the 6th and 5th centuries BC, the carpenters apparently were aware of the anatomical features characteristics of the tree species and could correctly decide on the tree type to the regarding.

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