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Reviewed Article:

Olives as a Dye for Wool Textiles

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Olives have been cultivated in the Near East for approximately 6,000 years. In Cyprus, they have been present since the Neolithic and were primarily used for food, oil, and byproducts of the oil (Besnard, et al., 2013; Chaniotis and Hadjisavvas, 2012). Olive trees overproduce fruit, and a large portion of the crop is dropped before harvesting time. Ground-fall olives are not considered suitable for making oil or preserved for eating since they are desiccated with little flesh left covering the pit. As a result, they are not included in the harvest. However, an additional use could have been for dyeing textiles.

> It is entirely possible that olives were used as a dyestuff in antiquity (...) The olives do provide a viable dye made from a product that would otherwise be unused and, as such, have the potential for another colour in the palette for ancient textiles.

Introduction

Few fragments of ancient textiles remain, and the preservation processes often change the colour of the fabric. A wide range of textile colours are, however, represented in Minoan frescoes (Burke and Chapin, 2016, p.27; Murray, 2016). In addition, the remains of dye works have been found in Gournia in eastern Crete and the island of Chryssi (Burke and Chapin, 2016, p.28). Identified dyestuffs include indigo, saffron, and madder, among other organic materials used as dyes (Burke and Chapin, 2016, p.28). This paper explores the possible use of a discarded product of the olive industry as a dyestuff through experiments.

Methodology

Mordant

Mordants are used prior to dyeing fibre to stabilize the dye and bond it to the fibre. Several mordants are used in traditional dyeing, including copper and copper sulphates, which can intensify the colour while shifting it towards green. Iron sulphate is also used as a mordant, which will darken the colour of the dye but creates a problem in that it can deteriorate the textile fibres. Alum in various forms has been used in antiquity and has the property of not altering the colour of the dyebath or affecting the physical quality of the fibre (Postrel, 2022, p.126). The forms of alum were in use in the Aegean in antiquity have been identified potassium aluminium sulphate (KAl(SO4)2·12 H2O), or ammonium aluminium sulphate (NH4) Al (SO4)2·12H2O). The crystals of ammonium aluminium sulphate can be gathered in deserts or volcanic regions. It can also be refined from alunite (KAl3(SO4)2(OH)6), a process that was in use in the Classical Period (500-400 BC) (Postrel, 2022, p.126). Pliny, in his *Natural Histories* discussed the availability of alum in Cyprus, describing how the mineral crystalises through evaporation in the summer months. (Firth, 2007, p.132). Alum that was used as a mordant for dyeing was also described in the Pylos Tablets (1250 BC) as being produced by a process of roasting alunite or kalinite, then soaking the mineral and dehydrating it to obtain the alum crystals (Firth, 2007, p.136).

Dyestuff

In mid-autumn (October on the northern coast of Cyprus) the olives begin to ripen on the trees, many of which fall to the ground before harvesting begins (See Figure 1). These olives tend to be smaller and less developed than the mature fruit that is harvested. Ground-fall olives were gathered by the author and then sorted by colour and hardness. Those which

were fleshy or at least leathery were separated from those which were completely dried. Green olives were discarded.

The wool

The wool was from a single Whitefaced Woodland sheep. Whitefaced Woodland fleece is a sturdy, somewhat coarse wool with a diameter of 35-38 microns, and a staple length of 4 inches. The wool is noted for having kemp (coarse guard hair), which takes the dye differently than the woolly undercoat. The double-coated wool is similar to the wool produced by primitive breeds of sheep. The fibre was spun by hand using a suspended spindle and finished as a three-ply yarn with 15 wraps per inch (commercially identified as fingering or sock weight). Wraps per inch (WPI) is a standard measure in which the thickness of the yarn is determined by the number of strands laid side by side that be can measured within one inch. The yarn also had an average of a 15-degree angle of twist. This means that it is a fairly fine yarn with a reasonably tight twist (Ekarius and Robson, 2015). All the wool used was cleaned, processed, and spun by the author (See Figure 2). Outside of a mild soap used for washing the raw wool, no other product was used for bleaching or cleaning the wool. The cleaned fibre was a bright white.

Experiment 1 - Ground-fall olives

These were olives that were gathered soon after they had fallen from the tree (See Figure 3). They ranged from soft, fleshy fruit to ones that were slightly leathery. All were dark purple coloured and somewhat soft to the touch. A dyebath was prepared using 450g of ground-fall olives for 62g of wool. Normally a 1:1 ratio of dye material to wool is recommended for dyebaths in order to provide a concentrated amount of the dye colour to the bath; however, since the stone makes up a large percentage of the weight of the olive, a larger quantity of the dyestuff was used. No matter how high the quantity, wool will only take up as much dye as it takes to be saturated (Beebee, 2014; Teresinha, 2024).

Before dyeing, the wool is mordanted to increase the bond of the dye to the fibre. Normally, 10%-20% of mordant to the dry weight of the yarn is used (Beebee, 2014; Teresinha, 2024). A non-reactive pot (one made of a material such as stainless steel or coated with enamel that will not cause a chemical reaction with the mordant or dye) was filled with 3 litres of bottled drinking water and heated to 90° C. Nine grams of alum (15% of the dry yarn weight) was dissolved in the water. The wool was added, and a temperature of 85-95° C was maintained for one hour. The wool was stirred occasionally, taking care not to agitate it to avoid compacting and felting the fibre. Afterwards, the wool was allowed to cool overnight in the alum solution. While the yarn was in the mordant solution, a dyebath was prepared by heating the olives in water in a non-reactive pot and maintaining a temperature of 85-95° C for one hour. Once they had soaked up enough water, the olives were gently crushed. Afterwards, the olives were allowed to cool overnight in the bath.

The next day, the yarn was rinsed to ensure all excess alum was removed. The olives were strained from the liquid, and sufficient water was added to bring the quantity to three litres, enough to cover the wool (See Figure 4). The dye bath was heated, and the wet yarn was put into the dyebath. The dye bath was kept at 85-95° C for one hour and allowed to cool for several hours. The yarn was hung to dry and then rinsed to remove excess dye, and once again hung to dry. The resulting yarn was a light yellow.

Experiment 2 - Freshly harvested ripe olives

A dyebath was made using fresh black olives purchased at the local market (See Figure 5). These were plump, fleshy olives that had been freshly picked from groves in the area and not put into a brine or salted. The experiment was repeated as above with 67g of Whitefaced Woodland wool yarn. The yarn was put into a heated bath with 10g of alum for one hour and left in the mordant overnight. Three hundred and fifty grams of ripe olives were simmered for one hour as described above. The olives were gently crushed while cooking. It was noted that these were much softer than the ground-fall olives and didn't need to soak up fluid before crushing. The olives were allowed to cool in the water overnight. The next day the olives were strained from the dye water and the yarn was rinsed to remove the excess alum and put into the dye. The solution was then heated and allowed to cool, as above. The result was a warm grey colour (See Figure 6).

Discussion

Both yarns were identical, coming from a single sheep and having no treatment other than washing in a mild soap before and after spinning. The dyeing treatments were also identical. In both instances, the dyebath was a dark purple. The only difference was the condition of the olives. The ground-fall olives did have some moisture, but on average were about a quarter of the size of the olives that had been harvested when fully ripe. It can be supposed that the degree of dryness of the olives had an impact on the colour of the dyed yarn (See Figure 7).

Conclusion

It is entirely possible that olives were used as a dyestuff in antiquity. The condition of the olives could allow for a variety of colours ranging from light yellow to warm grey. Other treatments, such as the addition of copper or iron sulphate could shift the colour or make it more intense, as could the addition of other dyestuffs. The olives do provide a viable dye made from a product that would otherwise be unused and, as such, have the potential for another colour in the palette for ancient textiles.

Keywords dyeing
wool

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FIG 1. OLIVE TREES AT HARVEST TIME. PHOTO BY E. GIOVANNA FREGNI.

FIG 2. WOOL BEING WET BEFORE MORDANTING. PHOTO BY E. GIOVANNA FREGNI.

FIG 3. GROUND FALL OLIVES. PHOTO BY E. GIOVANNA FREGNI.

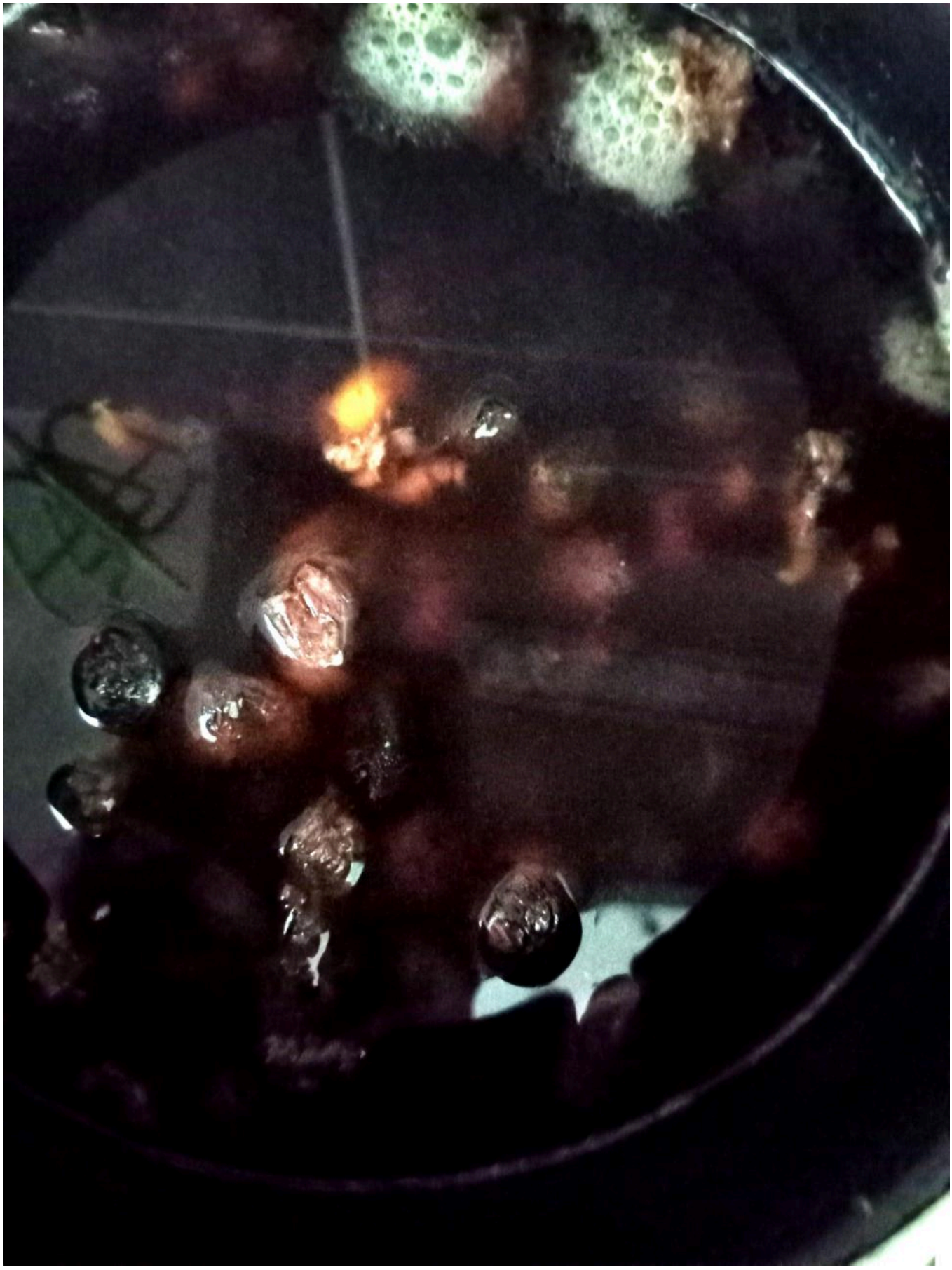

FIG 4. OLIVES BEING COOKED FOR DYE. PHOTO BY E. GIOVANNA FREGNI.

FIG 5. FRESH RIPE OLIVES IN THE MARKET. PHOTO BY E. GIOVANNA FREGNI.

FIG 6. YARN IN DYEBATH. PHOTO BY E. GIOVANNA FREGNI.

FIG 7. DYED YARN. PHOTO BY E. GIOVANNA FREGNI.