WEAVING THE HISTORY: MYSTERY OF A CITY

Sof

KOÇ UNIVERSITY

Vekam

Dyeing Mohair and *The Sof*

Turkish Cultural Foundation Cultural Heritage Preservation and Natural Dyes Laboratory

The Cultural Heritage Preservation and Natural Dyes Laboratory (DATU), established by TCF[1] in Istanbul in 2010, maintains the world's most extensive collection of natural dyes. The inventory consists of 680 dye plants, dye insects, seashells, and natural organic lake pigments.

Natural Dyeing

Natural dyestuffs are created from pigments obtained from natural vegetal or animal sources such as plants, insects, seashells and lichens. Throughout history, these dyes have been applied to various materials and most commonly used to colour textile fibres, such as cotton, linen, wool, mohair, and silk. Colouring these fibre types using natural dyes is called natural dyeing.

Three varying methods are employed in natural dyeing: these are direct, mordant and vat-dyeing methods. In the direct dyeing process, fibres are treated directly with natural dyes. In the mordant dyeing method, fibre is processed with a type of alum called a mordant, of iron, tin, etc., after which the material is dyed with natural dye(s). Another method, the vat-dyeing technique, is used to obtain blue pigment from indigo dyestuffs extracted from specific plants. In this method, because dyestuffs in indigo plants are not water-soluble, extraction is accomplished by reduction using ancillary substances. The fibre is dipped into a prepared dyeing liquor, allowing the reduced indigo to combine with the oxygen in the air, thus facilitating the dyeing process. Dyeing with this method is usually carried out for blue pigments and for the blue constituents of green pigments. However, some historical textiles show that it has also been used as the blue constituent of purple pigments.

Today, many natural dye projects have been started with the aim of supporting the use of natural dyes, and their numbers are increasing day by day. Natural dye projects are supported especially in countries like France, Spain and Italy. In Turkey, the Turkish Cultural Foundation (TCF) and ARMAGGAN Inc. have partnered in a pioneering effort for nearly a decade to improve natural dyes and reintroduce them into textile production. Studies show that natural dyes can be sustainable in the textile industry. Standard

1 This part is provided by the Turkish Cultural Foundation (TCF), Cultural Heritage Preservation And Natural Dyes Laboratory (DATU). The Turkish Cultural Foundation (TCF) was established in 2000 by Drs. Yalçın and Serpil Ayaslı. The mission of TCF is to support the preservation and promotion of Turkish culture and heritage worldwide. TCF is a U.S. tax-exempt public charitable organization supported by a Trust established by the Ayaslı family and private donations. It has offices in Boston, Washington, D.C. and Istanbul, Turkey. The mission of TCF is to increase knowledge of Turkey's cultural heritage and to highlight Anatolia's contributions to world culture and humanity while building people-to-people cultural exchanges across the world. TCF has been accepted into official relations with UNESCO in 2015.

Turkish Cultural Foundation Cultural Heritage Preservation and Natural Dyes Laboratory- Natural Dyeing of the Mohair
2018
9.06'

This video footage shows the natural dyeing of the mohair yarn and dyeing of mohair tops in ten different colours in the laboratory environment.

dyeing methods are determined at the DATU laboratory within the scope of these studies and applied at the industrial scale.

Dyeing *The Ankara Sof*

Firstly, the mohair collected from Angora goats is purified of straw and other contaminants. Next, the mixed breeds and lengths of the mohair are sorted. Mohair fibres are separated by breed, height and variety. Usually particular care is taken to separate coarse fibres from the fine. This mohair is then combed with long-toothed special iron combs. The fibres are straightened and separated from each other. These are then placed in parallel arrays. The combing process helps separate short strands, waste and dirt. The separated short and coarse mohair is called küreğit and not used in weaving fabric. Long mohair is formed into mohair hanks.

After this stage, next comes the process of dyeing the combed and sorted mohair in various colours. Dyeing is performed using two different methods. Mohair is dyed either directly before or after washing. Usually, however, dyeing takes place in great boilers before washing.

Historically, *the Ankara sof* was dyed mostly with vegetable dye sources, with annual or biennial plants grown in and around Ankara. The most commonly used plant sources are walnut shells, oak acorns, madder, buckthorn, weld, dyer's sumac, dyer's woad, and safflower plants. Mohair is boiled according to the desired colours in boilers with adequate water, with little or a lot of mixing. All dyed mohair is then taken out of the boilers and washed in cold water. Next, it is dried by spreading it on the ground, or hanging it from ropes and poles. Thus, the mohair is dyed to the desired colour. *The Ankara sof* may be dyed after weaving or in the form of yarn, too. The most important stage in the *sof* process is the dyeing. The role of a competent dyeing master is vital at this point, and it is said that there were only five mohair masters in Ankara in 1707. Another important element in dyeing is the quality of water. The water used for dyeing must be very clear and pure. The dyed *sof* is washed thoroughly in cold water and dried. The mohair, prior to being dyed, is washed thoroughly in large boilers with lukewarm water and soapwort. Thus, all of the impurities are washed out of the mohair, leaving it a lighter colour and as bright as silk. As the dyed and washed mohair is now mixed together, they are subjected to a second combing; the strands are disentangled and smoothened. After completion of the dyeing and all other processes, *the Ankara sof* is ready for use.

Identification of *The Ankara Sof* and Other Historical/Archaeological Textiles

Although there are different analytical methods adopted for the determination of the dyes present in *the Ankara sof* and other historical and archaeological textile artefacts, the most preferred method is liquid chromatography. The device used

for this purpose is High-Performance Liquid Chromatography HPLC. A sample of between 0.5 to 3.0 mg is adequate for analysis. The dyes in the sample, following hydrolysis and solubilisation, are loaded on the HPLC apparatus in the form of a clear liquid. The obtained results are compared to the preloaded pure certified dyestuff standards on the device to determine dyestuff source(s) and colouring compounds. The result reveals the identity of both the work and the type of dyeing material to be used in restoration. Another analysis technique in textiles is fibre analysis. This technique may be used to determine the type of plant or animal fibre by conducting simple spot tests, as well as precise detection of the fibre used for the artefact with the aid of advanced devices such as electron microscopes. If the material features other elements such as wire, gold thread, sequin, bead, etc., electron microscopy and a linked EDX detector system detects components of these materials. The CIELAB spectrophotometer is used for measuring colours on the artefact's surface. Colour values are expressed numerically as Lab, CMK or RGB. Finally, technical analyses reveal data on the weave types of textile works, warp and weft density, yarn twist direction, number of twists etc.

Saffron *(Crocus sativus L.)*
Used for yellow and orange colours.

Saffron *(Crocus sativus L.)*
November, 2012
Collected from Safranbolu, Karabük.
TCF DATU Natural Dyes Collection
Used for yellow and orange colours.

Anatolian Buckthorn
(Rhamnus petiolaris L.)
July, 2013
Collected from Nevşehir.
TCF DATU Natural Dyes Collection
Used for yellow colour.

Madder *(Rubia tinctorum L.)*
September, 2011
Collected from Ankara, Ayaş.
TCF DATU Natural Dyes Collection
Used for red colour.

Weld *(Reseda luteola L.)*
June, 2012
Collected from Ankara, Ayaş.
TCF DATU Natural Dyes Collection
Used for khaki and olive green colours.

Kermes *(Kermes vermilio Planchon L.)*
June, 2011
Collected from Çanakkale, Güzelyalı.
TCF DATU Natural Dyes Collection
Used for red colour.

Safflower *(Carthamus tinctorius L.)*
July, 2013
Collected from Ankara, Beypazarı.
TCF DATU Natural Dyes Collection
Used for yellow and red colours.

Valonia Oak *(Quercus ithaburensis Decaisne L.)*
September, 2014
Collected from Çanakkale, Kepez.
TCF DATU Natural Dyes Collection
Used for grey and black colours.

Cochineal *(Dactylopius coccus Cost*
2014
Collected from Mexico.
TCF DATU Natural Dyes Collection
Used for red colour.

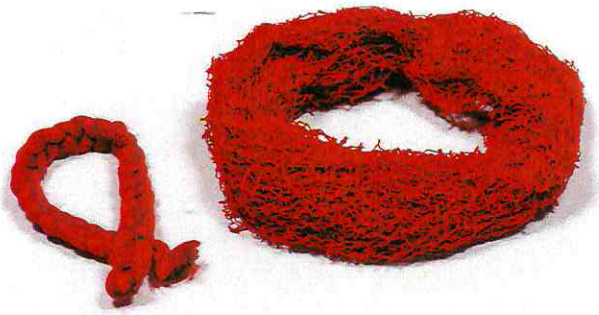
Dyer's Sumac
(Cotinus coggygria scop Rhus cotir
June, 2012
Collected from Bolu, Mudurnu.
TCF DATU Natural Dyes Collection
Used for yellow colour.

Woad *(Isatis tinctoria L.)*
September, 2011
Collected from Ankara, Nallıhan.
TCF DATU Natural Dyes Collection
Used for blue colour.

Walnut Shell *(Juglans regia L.)*
August, 2017
Collected from Çanakkale, Dardanos.
TCF DATU Natural Dyes Collection
Used for brown colour.

Alum *(Alumen)*
Used for fixing colours.

Dyed Samples



Mohair Yarn and Mohair Tops Dyed Ultramarine with Natural Indigo Plant
2018
46,7x2,5 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Red with Dyer's Madder and Oak Acorn
2018
48x3 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Light Blue with Natural Indigo Plan
2018
48x3 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Purple with Cochineal and Oak Ac
2018
44,5x3 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Maroon with Dyer's Madder, Walnut Shell and Oak Acorn
2018
48,5x3 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Brown with Walnut Shell and Oak Acorns
2018
46x2,5 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Dark Pink with Cochineal Beetle and Oak Acorn
2018
44x2,5 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Pink with Cochineal and Oak Acorn
2018
46x2,5 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Green with Natural Indigo, Dyer's Weed (*Reseda luteola L.*) and Oak Acorn
2018
45,5x2,5 cm
VEKAM/Ankara Orchard House Collection

Mohair Yarn and Mohair Tops Dyed Yellow with Dyer's Weed, Dyer's rocket and Oak Acorn
2018
46x2,5 cm
VEKAM/Ankara Orchard House Collection

WEAVING THE HISTORY: MYSTERY OF A CITY

Sof

KOÇ UNIVERSITY

Vekam

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ISBN: 978-605-9388-13-9

First Printing: 500

Ankara, 2018

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Responsibility for the ideas and views set out in these articles lies entirely with their author(s).

This exhibition catalogue is published within the framework of the *Weaving the History: Mystery of a City, Sof* Exhibition at the Rahmi M. Koç Museum Ankara, 12 May-16 September 2018.

This exhibition catalogue is the English translation of the Turkish catalogue printed with the original title Tarihi Dokumak: Bir Kentin Gizemi, Sof.

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VEKAM Publication No: 44

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Cultural Heritage Preservation And Natural Dyes Laboratory

The Cultural Heritage Preservation and Natural Dyes Laboratory (DATU), established by TCF[1] in Istanbul in 2010, maintains the world's most extensive collection of natural dyes. The inventory consists of 680 dye plants, dye insects, seashells, and natural organic lake pigments.

The laboratory has produced 30 natural organic lake pigments, organic dye of vegetal and animal origin. These pigments may be used also as natural, organic ink in traditional Turkish arts such as paper marbling (*ebru*), illumination (*tezhip*) and miniatures. Natural organic pigments have been used in the past in sacred books, paintings, icons, manuscripts, leather and murals. Organic natural lake pigments are used also in restoration work in these fields.

DATU – Cultural Heritage Preservation and Natural Dyes Laboratory also produces printing dyes, which play a vital role in the textiles industry. Dyestuffs of plant and animal origins manufactured by DATU are non-toxic, non-carcinogenic and non-polluting. Fabrics dyed and printed using eco-friendly and human-friendly natural organic dyes can be imparted natural antibacterial, anti-fungal, anti-UV and antimicrobial properties of plant origin. The laboratories also carry out R&D work, using traditional dyeing prescriptions to research increased durability against light, sweat, friction and water. The laboratory is involved in various projects, such as TUBITAK projects, publishes all its research in international and national journals, and presents it in symposiums and conventions.

The secret of Turkish Red, a pigment and dyeing process which held an important place in the dyeing industry, was lost for over two hundred years. It was rediscovered through research work supported by TCF and undertaken by DATU and patented by the Turkish Cultural Foundation (Turkish Patent Institute patent number TR 2015 00638 B).

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The material characterization, dyestuff analysis, colour measurement and technical analyses of archaeological and historical objects are conducted at the DATU Laboratory via non-destructive microanalysis methods and the highest technology. Information regarding weave types, warp and weft densities, direction and number of yarn twists etc. is acquired through technical analyses. These measurements and analyses, often conducted free of charge with the support of the Turkish Cultural Foundation, provide significant data for restoration and conservation. Moreover, these analytical methods also hep to correctly date historical and archaeological artefacts. Scientific and technical support is provided for the restoration of works in accordance with the acquired data.

The history of natural dyeing is virtually as old as that of weaving. Archaeological excavations conducted at the Mohenjo-Daro site, in the Indus Valley within today's Pakistani borders, have revealed a small amount of blue pigmentation in cracks in the ground stones. The indigo dyestuff found in this settlement that has been dated to BC 3,500 is the oldest and most important natural dye that has been recorded. Considering that this region belonged to India at the time, it is assumed that the first place where indigo was ever used was probably India. Another excavation conducted later at the same site unearthed two red coloured money pouches made of cotton fibre dated to BC 3,000. These were probably dyed with madder species (*Rubia sp.*). However, these money pouches were not properly preserved and disintegrated after the excavation. Clay tablets found in Nippur, one of Sumer's largest cities, reveal that spinning, weaving and dyeing were developed towards the end of BC 4000, during the same period when indigo was used in India. In addition, vat dyeing and mordant dyeing were mentioned also in other tablets discovered in the Mesopotamia Region. Natural dyeing, now known to date from 5,000 to 6,000 years ago, continued until 1856 when William Henry Perkin synthesised aniline dyes. Use of natural dyes has gradually decreased since that date.

The Ankara *Sof*

The Ankara *sof* is a kind of fabric woven from mohair harvested from the Angora goat, which is prominent among animal fibres in the textile industry for its length, robustness and brightness. From spinning of the mohair fibre into yarn, to weaving the yarn into cloth and finally dyeing the cloth, all phases of *sof* production comprise a distinctive craft widespread in Ankara and neighbouring provinces. The *sof* weavings preferred by the society elite throughout history were traditional weavings peculiar to the province of Ankara and Central Anatolia. In this respect, the Ankara *sof* holds a significant place within the cultural heritage of this geography. The finer-spun mohair was, the more desirable *sof*, the woven fabric would be regarded. Ankara *sof* was appraised for its fine weave, and soft, shiny and silky appearance. These fabrics were also highly durable. *Sof* fabric production was known to involve some long and arduous production stages, listed as the process steps below.

1. Procurement of mohair wool (shearing, collecting, aeration, cleaning, sorting, screening),
2. Combing,
3. Spinning,

4. Dyeing,
a) Mordanting,
b) Dyeing,
c) Washing,
5. Sizing,
6. Placement / adjustment / spooling,
7. Weaving (four-fold, four-treadle, three-fold),[2]
8. Washing/dry finishing,
9. Buffing,
10. Watering.

Natural Dye Sources Used In Ankara *Sof* Processing

1 – Madder (*Rubia tinctorum* L.): Dyer's madder (*Rubia tinctorum* L.) is the best-known red dye, used since ancient times. The roots of these plants are used for dyeing. Best for the purpose are 3-year-old roots. Dyer's madder contains various dyestuff groups, but alizarin and purpurin are the best-known dyes. Dyer's madder is known in Anatolia under many different names: dye root, dyer's root, dye *pürç*, dye çil, red root, red dye, scarlet root, dye ivy, egg dye and tongue bleeder, etc. Many different colours may be obtained through the method of dyeing with dyer's madder with various mordant materials. These are red, rose, purple, reddish-brown, orange, reddish-black, and reddish-blue. The red obtained by the application of dyer's madder with multiple mordants and further dyeing has been known historically as *Turkey Red* or *Edirne Red*. Anatolia very likely is the motherland of dyer's madder. In Anatolia, the most common farming ground is the Central Anatolia region. Nevertheless, it seems to have spread naturally to the Caucasus, Iran, Midwest Asia and the Himalayas. Dyer's madder is known to have been used particularly for dyeing Ankara *sof*, the same way it has been used across Anatolia. There is evidence that dyer's madder was traded between the East and the West as far back as the 1st Century. According to one writer from ancient Greece, the earliest trade for dyer's madder took place between India and Anatolia. The Egyptians, the Greeks and the Romans used this plant in dyeing. The Romans first brought the plant to Central Europe and cultivated it there. Farming for dyer's madder began in Europe in the 8th century, albeit in small quantities. Later, Baghdad became the major trading centre for dyer's madder. By the 10th century, Netherlands and Germany had accomplished many advances in the production of dyer's madder. In Europe in the 18th century, dyer's madder had become a highly important economic crop. In the 19th century, France became an important producer of dyer's madder in Europe. French producers managed to compete with manufacturers of synthetic dyes until 1870. In fact, French governments dyed the uniforms of their troops using dyer's madder. Up to this day, dyer's madder has been identified in analyses to be the source of the red colouring in many eastern carpets, Ottoman carpets, *Hereke* carpets and many other fabrics from different periods.

2 – Weld (*Reseda luteola* L.): The weld (*Reseda luteola* L.) is a biennial plant that can grow to a height of up to 1.5 metres. There is no need for fertile soil for the plant to grow. The weld can grow in moist, sandy and pebbly soil. This plant

2 There are three types of *sof*: Thick fabrics are woven with yarn twisted four-fold. The four-treadle weave is the most sought-after, patterned and highest quality *sof*. Three-fold weaving creates plain *sof* (Translator's Note).

has been observed to grow spontaneously at waysides a year after road construction, as well as rocky places of 400-1,500 metres high. All aboveground parts of the plant are used in dyeing. The main colouring dyestuffs of the plant are *luteolin* and *apigenin*. Weld produces a yellow pigment, but khakis and olive greens may be obtained using different mordants. This plant is cultivated intensively in Anatolia, particularly in the Ankara region, north Marmara, the Aegean region, as well as western Black Sea. It is known that weld has been used in textile dyeing as far back as prehistoric times. Weld seeds from the Neolithic era were found in a lake excavation in Switzerland. It was widely cultivated and used in dyeing during Hellenistic and Roman times. Weld is believed to have been used to dye nuns' habits and wedding dresses. Pliny the Elder claims that only women's dresses were dyed with weld. Dyestuff analyses of Coptic textiles from the 3rd to 10th centuries have revealed that weld was extensively farmed in Egypt. These textiles were yellow from weld, and orange made from a mixture of weld with madder; and green, from a mixture of weld and woad(indigo). Yellow colorant analyses have revealed that during the 16th century, one of the most brilliant periods in the history of Turkish carpet making, the Uşak-made carpet type *Lotto* was dyed with weld. Weld was a highly popular dyeing plant during Ottoman times, and has been used frequently in dyeing both wool and silk. It was used in the yellow colours of Ottoman fabrics and as the yellow component with woad (*Isatis tinctoria L.*) used for green. Weld has been cultivated in Europe and America for centuries. Cultivation of the plant in Turkey and in Europe has continued until the end of the 19th century.

3 – Anatolian Buckhorn (*Rhamnus petiolaris* Boiss): *Rhamnus petiolaris* is a buckthorn species known in Anatolia with a variety of names, such as *altin agaci* ("gold tree"), *alacehir, boyacı dikeni* ("dyer's thorn") and *akdiken* ("white thorn"). There are 22 species of *Rhamnus sp.*. Small yellow-green flowers bloom during May to June. Green seeds (drupes) formed from these flowers turn brown or black after a long while. The drupe, 6 to 7 mm in diameter, is yellow inside a brown shell. *Rhamnus petiolaris*, the "gold tree," is endemic in Central Anatolia. This plant is cultivated in Central Anatolia, Turkey, particularly in the Ankara, Kayseri, Çorum, Gaziantep, Sinop, Afyon, Uşak, Yozgat, Tokat, Nevşehir, Niğde, Kahramanmaras and Konya vicinities. The drupes of the buckthorn are used in the dyeing process. The main colour obtained from *Rhamnus petiolaris* is a deep, bright yellow. Colours like orange-yellow, khaki and olive green are also obtained using a variety of mordants. Its main dyestuffs are *rhamnetin, isorhamnetin, quercetin, kaempferol* and *emodin*. Dyestuff analyses show that buckthorn was used to obtain yellow pigmentation for many Anatolian carpets woven in the 15th to 17th centuries. It was also exported from Anatolia to many countries around the world for its use in dyeing silk wool and mohair fibres until the early 20th century. Buckthorn was used as the yellow component of yellow and green-yellow Ottoman fabrics in the 16th century. It was also an important dyestuff in the 19th century. *Rhamnus petiolaris* continued to be cultivated in the 20th century, too. Buckthorn was used often for the yellow–coloured parts of the earliest examples of Hereke carpets. This plant is known to have been used also for dyeing Ankara *sof*.

4 – Walnut Shell (*Juglans regia* L.): The outermost green shells and leaves of the common walnut are used in dyeing. It is known as a very important dyestuff fur brown pigmentation. The green walnut shells and leaves of walnut have been used in brown dyeing since ancient times. The most effective dyestuffs contained in walnut shells are *juglone* and tannic acid groups. Ancient Greek and Roman literatures reveal that the walnut tree was cultivated during those eras. Roman Pliny the Elder imparts prescriptions for grey and brown-coloured hair dyes made of walnut shell. The Romans have carried the walnut tree from Greece to Italy and then over the Alps into France, and then to Germany. England and Germany developed their own production, when the walnut tree came to their countries. Quite a few sources cite the use of walnut shells for brown dyeing. Although walnut shell dyestuffs were not used in 15th to 17th century Turkish carpets, it was used in Iranian carpets of the same period. Today, however, walnut shells are used in brown dyeing in both Iran and Turkey. One of the basic dyestuff sources used in the Medieval Europe was the bark, branches and leaves of this tree. In France, walnuts played a significant role in the textile dyeing industry in the 17th century. It was used to dye soldiers' uniforms during the American Civil War of 1861-1865. The uniforms of Turkish soldiers in the Independence War (1919-1922) were dyed with walnut dyestuff. Nowadays, it is still in use, albeit in small amounts, in Anatolian textiles.

5 – Valonia Oak (*Quercus ithaburensis* Decaisne): The Mount Tabor oak is a plant species endemic in Greece and Turkey, and especially in the Aegean region of Anatolia. There are upwards of 20 distinct species of Quercus (oak) in Turkey. Their fruits are generally called "acorn" without any distinction. This is the part of the plant used in dyeing. The main colour is a milky brown, and a scale of grey to black may be obtained using various mordants. The dyestuff that acorns contain are tannic acid groups. The most effective ones are the ellagic acic and gallic acid dyestuffs. Acorn has been used as human and animal food since the Stone Age (50,000 BC and earlier). It has been used frequently in the past, in leather dyeing and tanning. It has been used often with iron mordant to obtain the black dye used in Turkish carpets and kilims. It was also combined with iron for black ink used in historical manuscripts. However, this plant's iron complex develops a strong acidic effect over time, which causes damage and deep cuts on the applied surface.

6 – Safflower (*Carthamus tinctorius* L.): The safflower plant is cultivated primarily as an oil crop, but has numerous uses in various other fields, such as art, paper, textiles, food and cosmetics. Dried petals of safflower are used to produce yellow and red pigments. Obtaining red colouring is somewhat more demanding than yellow dye. The most effective dyestuff it contains is *carthamin*. It is mostly cultivated in Anatolia in the Ankara region, as well as in the Afyon, Kütahya, Eskişehir, Çankırı, Isparta and Şanlıurfa provinces It is known in Anatolia as *cartham*, *aspur*, *asfur*, "bastard saffron," parrot feed, and dyer's safflower.

This plant has been widely used in textile dyeing processes in the past for its yellow and red pigments. In the 16th and 17th centuries, between 1557 and 1628,

safflower was used in silk carpets belonging to Shah Abbas I of Persia. There are also Anatolian resources that attest to the use of this plant in dyeing. Analyses of historic Ankara *sof* dyestuffs in museums have revealed use of this plant.

7 – Woad (*Isatis tinctoria* L.): Nearly 30 species of woad grow naturally in Turkey. It comes into yellow flowers in June-August. Woad has been used for its blue dye in Mesopotamia in ancient times. It was also known in Ancient Greece and the Roman Empire as a source of indigo dyestuff. Analyses of blue Masada textiles of AD 73 and blue Palmyra textiles of AD 273 have revealed woad (indigo). The blue colours of these textiles were most likely obtained from the woad plant. Dyes obtained from woad are used also as pigments in other areas, in addition to textile dyeing, such as murals, art and dyed papers. Woad was widely cultivated in France and Germany in medieval times. Dyer's woad is used in the Ankara *sof* fabrics as the blue component of the green colouring.

8 – Dyer's Sumac (*Cotinus coggygria* Scop, syn. *Rhus cotinus*): Dyer's sumac has been known as a dyestuff source since the Romans. It was widely used in Europe during the middle ages; and represents an important niche economically. Roman author Pliny the Elder, who lived between the years AD. 23 - 79 wrote about its use in leather dyeing. It is known that dyer's sumac (*Cotinus coggygria* syn. *Rhus cotinus*) has been used widely in Europe in the 19th century for yellow in dyeing fabrics, especially silk. Uniforms and tents of Turkish soldiers during the First World War were dyed using the leaves and thin branches of this plant. It was also used in 19th century Anatolia to dye yarn yellow. Dyer's sumac was observed to have been used especially in the yellow colours of *Taşpınar* carpets and in Ankara *sof*.

9 – Kermes (*Kermes vermilio* Planchon): This dye insect is a parasite of the *Quercus coccifera* (kermes oak), *Quercus ilex* (evergreen oak) and *Quercus robur* (common oak) species of evergreen oaks, found in parts of the Mediterranean coast and up to the Zagros Mountains of Iran.

The word "*kermi*" in Sanskrit means worm. This became *qirmiz* in Arabic, *kermes* in Persian, and *kırmızı* in Turkish, all meaning "red." The English word crimson is derived also from the same root. Kermes dyeing held an important place in the Near East and Southern Europe for many centuries. The use of the kermes for dyeing was known also by the Sumerians around BC 3000. Many Sumerian clay tablets depict weaving and dyeing techniques for woollen fabrics. It was known in ancient Mesopotamia that the kermes insect was the chief source for red pigment. A clay tablet found in archaeological excavations in Babylonian *Nuzi*, modern *Yorghan Tepe*, near Kirkuk in Iraq, tells us that the kermes insect was used in dyeing textile fibre red. Texts in Torah indicate that kermes insects were used in dyeing processes in BC 1400s. Persians used kermes insects to obtain the red colouring of their fabrics and many carpets. In fact, it is a well-known fact that red dye was spread worldwide by the Persians. Romans termed dyes obtained from kermes *scarlatum*. The kermes insect, during this period, was used for dyeing different types of fibres, such as silk, wool, etc. Pigments obtained from these insects were used also in their murals and icons. Kermes were collected at Venice and Marseilles during the middle ages and

exported to other European countries. Venetians considered the red pigment obtained from kermes a superior colour. They have overseen kermes production techniques and maintained its quality. Thus, their kermes dyes came to be known all over the world as "Venetian red." After the conquest of Istanbul (1453) by the Ottoman Empire, Fatih Sultan Mehmet banned the use of seashells in dyeing, thus increasing the prominence of kermes dyeing. The Roman Cardinals' ban of 1464, also prohibiting the use of seashells greatly increased the use of the kermes.

10 – Cochineal (*Dactylopius coccus* Costa): The Cochineal is a scale insect native to Central America, and lives as a parasite on a cactus known as *Opuntia cochenillifera*. It was brought to Anatolia with the acceleration of geographical discoveries in the early 16th century. Dye analyses have revealed that the bright red palace fabrics were dyed with the pigments obtained from the cochineal. It was also determined that the insect has been used in mohair, as in the Ankara *sof*, as well as in wool dyeing. Cochineal was one of the most important dyestuff sources used in colouring textiles red in its motherland Mexico around BC 1000. The insect was not known outside Mexico until the early 16th century. However, a species found in the Old World (Asia and Europe), at Mount Ararat and the banks of the River Aras, was known as the "Ararat cochineal". Cochineal was discovered by the Spanish in Mexico in 1512, and they began to use it as a dyestuff in various fields, but mainly textiles in Europe and Asia. The Spanish first shipped the cochineal from Mexico to Spain. Later they traded it with other countries in Europe and Asia. This insect found a very good niche in the market, because it contained more dyestuffs than various similar insects in Europe and Asia (the Ararat cochineal, lac insects, and Polish cochineal) and yielded brighter and more sumptuous colours. Nearly 1100 tons of cochineal are consumed annually in the world. Statistics show that in 2002, 1045.9 tons were produced. Today it is used in food colouring and cosmetics besides dyeing textiles. Peru leads world production of cochineal.
Source: Turkish Cultural Foundation – TCF

11 – Saffron (*Crocus sativus* L.): Saffron consists of the dried stigmata of the crocus species *Crocus sativus* L. (*Iridaceae*). It is a tuber plant, which can grow up to 20 centimetres and blooms with large purple flowers in the autumn. It is cultivated in Safranbolu villages. Saffron is used as a fragrance and a dyestuff.

Anatolia is the saffron plant's motherland, where it has been cultivated in the region since 3000 years. It is used not only as a dye plant but also in the fields of medicine and cosmetics. Homer, Hippocrates, Pliny, and many other ancient authors have mentioned saffron. This plant had been cultivated in ancient times, and then spread through Iran to further east. Arabs carried saffron to Europe via the Moors of Spain. Today saffron is cultivated in Morocco, Spain, Sweden, Iran and Kashmir. Saffron was used to dye textiles in ancient cities such as Sidon and Tyre. Ancient Persians cultivated *Crocus sativus* in Derbena, Isfahan (modern day Iran), and Khorasan (modern day Afghanistan) by the 10th century BC. Saffron was also used as a dye plant in the woven fabrics offered to the gods. Saffron was used for yellow and orange colour in illuminations of 13th century and medieval manuscripts.