II. INTERNATIONAL EDİRNE RED SYMPOSIUM

“Natural Colorants from Plants”

October 2-5, 2023
Edirne - TÜRKİYE

EDITORS
Prof. Dr. Mustafa TAN
Dr. Tolga ERDOĞAN











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Prof. Dr. Erhan TABAKOĞLU
(Rector of Trakya University, Edirne-Türkiye)

Edirne, the meeting point of different cultures and civilizations, has a rich history and unique cultural values. These lands have hosted different cultures for thousands of years, from the Thracians to the Roman, Byzantine and Ottoman Empires. Each civilization has left cultural or architectural traces on this city. Unfortunately, some of these values have been lost or lost their importance over time. The magnificent Edirne Red, which fascinated Europe in the 17th and 18th centuries, has become one of our cultural values forgotten over time. This magnificent color, obtained through long and laborious processes with the dye obtained from the roots of the madder (*Rubia tinctorum* L.) plant, is being tried to be brought back into the city culture with the intense work of Trakya University. Our university's studies on Edirne Red have intensified especially after 2017. With the projects, publications, books, exhibitions, interviews, panels, field days and symposiums produced in the last six years, public awareness has been created and some commercial activities have been initiated.

Our university's "*1. International Edirne Red e-Symposium*" is the first major scientific meeting on this subject. The more comprehensive meeting of this meeting, "*2. International Edirne Red Symposium*" was held in Edirne on 2-5 October 2023. At the symposium, whose main theme was *Natural Colorants from Plants*, 46 papers were presented by 62 participants from 7 different countries. Researchers from Greece, Bulgaria, Romania, Serbia, the Netherlands and Iran, mostly from Turkey, attended the symposium. During the symposium, in addition to scientific presentations, events such as exhibitions, a madder harvest activity and a trip to the Silk Museum in Soufli, Greece, were also held.

The 2nd International Edirne Red Symposium has made great contributions to Edirne Red studies. Edirne Red has been discussed with different aspects such as history, economy, literature, textile, agriculture, food and tourism. Researchers from different institutions came together and new areas of study were determined. This symposium has been completed as an important stage for the activities to be carried out from now on. The final work of the symposium is the 2nd International Edirne Red Proceedings Book, which brings together the presented papers.

I would like to thank the scientists who made valuable contributions to our symposium and book, which we realized based on the fact that national development is possible by carrying local values to today's world. I would like to thank Prof. Dr. Mustafa Tan, Assoc. Prof. Dr. Nilgün Becenen, Assoc. Prof. Dr. Gülşah Gedik, Assoc. Prof. Dr. Adnan Tülek, Asst. Prof. Dr. İsmail Yüce, Lec. Burak İşçimen, Lec. Orkun Akman, Lec. Necla Sevinir Bakla, Agric. Eng. M.Sc. Merve Güzel, Nadir Kartal, Lec. Dr. Tolga Erdoğan, Res. Asst. Dr. Gökben Şahin and Res. Asst. Hakan Nazlı, who were on the organizing committee, and everyone who contributed. I hope it will be a resource that will inspire researchers.

Greetings and respects…

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PLANT BASED NATURAL DYES AND WOOL YARN APPLICATIONS

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ABSTRACT

Plant based natural dyeing is a dyeing process obtained from the dyes of various plants. These dyestuffs are generally obtained from different structures of plants such as roots, stems, leaves, flowers, branches, underground shoots. Natural dyeing is the process of applying recipes that have been used traditionally from past to present within the framework of certain methods. As one of the richest regions in the world in terms of plant diversity, natural dyestuffs have been produced in many regions of Anatolia for centuries and have been used especially in the textile field. These dyestuffs are also of great importance in the weaving culture, which is among the traditional handicrafts. Especially in recent years, with the return to nature, herbal natural dyes and natural dyeing have come to the fore. In this context, dyeing applications with traditional methods and recipes using various herbal dyes are aimed. In this study, applications were made to 100% wool yarns using Daisy *(Anthemis chia)* and Madder / Root Dye (*Rubia tinctorum* L.*)* In herbal dyeing, natural dyeing processes and processes are presented.

Keywords: Natural dyestuff, Wool yarn, Plant coloring.

INTRODUCTION

Mankind's use of colored substances in nature to obtain dyestuffs dates back thousands of years. Natural dyeing is a dyeing process made by using dyes found in various plants and insects. The use of dyestuffs in plants dates back to the Bronze Age (Dölen, 1992). Herbal natural dyeing is a dyeing process obtained from the dyes of various plants. These dyestuffs are generally obtained from different structures of plants, such as roots, trunks, leaves, flowers, branches, underground shoots, roots, seeds and seeds. Dyeing is performed with the prepared extracts using various

techniques (Şanlı, 2011). It is thought that dyestuffs originally extracted from colored flowers with water were transferred to the fiber. However, it has been discovered that such direct (substantive) dyestuffs are not resistant to washing and sunlight, and it is predicted that mordant dyeing occurred by chance (Dölen, 1992).

Natural dyeing is the process of applying recipes that have been used traditionally from past to present within the framework of certain methods. In many regions of Anatolia, which is shown as one of the richest regions in the world in terms of plant diversity, natural dyes have been produced for centuries and used in many areas such as medical treatment, and many applications have been made, especially in the field of textiles (Tüm Cebeci, 2020). Collection of material and time of collection is an important issue because; the quality of dyestuffs reaches its highest level as the plants mature. At the same time, ecological conditions (heat, humidity, soil, rainfall) significantly affect the amount of dyestuff to be obtained (Arlı, Kayabaşı, Ilgaz, 1993). During the Ottoman period, cities such as Bursa, Edirne, Istanbul, Tokat, Kayseri and Konya were among the centers where the dyeing craft was highly developed. At the same time, dyeing and cultivation of special dye plants were carried out in many regions of Anatolia (Arlı, 1984).

In this research, herbal natural dyeing, which dates back to ancient times and has been practiced but is not practiced as frequently as it used to be due to the increasing use of synthetic dyes, was examined. Because in recent years, with the return to nature, herbal natural dyes and natural dyeing have come to the fore. In this context, dyeing applications with traditional methods and recipes using various herbal dyes are aimed. In this study, for orange color dyestuff; Daisy *(Anthemis chia)* and Madder / Root Dye *(Rubia tinctorum* L.) was used for the red color. The aim was to apply red color tones and accordingly color 100% wool yarns according to traditional recipes.

MATERIAL AND METHOD

Material

Application studies were carried out with 100% natural wool yarn, mordant materials, auxiliary materials and vegetable dyestuffs. The dyestuff used is; Daisy *(Anthemis chia),* Madder / Root Dye *(Rubia tinctorum* L.).

Method

Mordanting process of 100% natural wool yarns, preparation of dye extracts, and mordant dyeing method were used. 100% natural wool yarns, mordant material, herbal dyes and application processes used in the research were carried out in the Natural Dyeing Laboratory of Marmara University Faculty of Fine Arts, Department of Traditional Turkish Arts.

APPLIED DYEING METHODS

Mordant Dyeing

The majority of natural dyes consist of mordant dyes. Such dyestuffs cannot bond with the fiber directly and spontaneously through chemical bonds. For this, an intermediary substance is needed to ensure and strengthen the bonding of dyestuffs and fibers. Such substances are called "mordant" (Enez, 1987). Mordant has a binding function between textile fiber and dyestuffs. The substances used for this purpose are called mordant substances. In the historical process of the mordanting process, approximately B.C. It was seen to have emerged in India around 2000. B.C. Around 3000 BC, the Sumerians obtained alum and iron sulphate in pure form. Therefore, alum was used as one of the first chemical compounds known and obtained in pure form. In the Anatolian region, alum, B.C. It was produced by the Hittites around 2000 BC (Dölen, 1992). Alum, one of the most commonly used mordant substances, was also used in the application study (Table 1).

NATURAL DYES USED IN APPLICATION

Daisy *(Anthemis Chia)* and Madder (*Rubia tinctorum* L.)

To obtain the orange color, first yellow color dyeing is done and then madder is added to the same dye bath to create orange color. Depending on the amount of madder, a light or dark shade of orange can be obtained. While painting, work is carried out first with the daisy plant and then with the madder plant. The mordant dyeing process and application of Daisy and madder plants and wool yarn are presented in (Table 2).

Madder (*Rubia tinctorum* L.)

It is the most widely used herbal dye in Turkey (Dölen, 1992). It is a 1-2 meter tall plant that grows in fertile soil. Turkey has been seen as the homeland of Madder. In the 1700s, Turkey provided two-thirds of the world's madder needs (Eşberk and Köşker, 1945). At the same time, the color obtained with Madder *(Rubia Tinctorum)* has become famous and known as Turkish Red or Edirne Red in the history of dyeing (Genç, 2014). In international literature, it is called Turkish Red, English (Turkish Red), French (Rouge de Turc) and Edirne Red (Rouge de d'Andrinople) in Europe. It has been seen as a historical color in France, where awards were given to those who solved the secret of the dyeing method (Gönenç Güler, 2020).

When madder was examined, it was determined that the dyestuffs were found in the root of the plant. In the dyeing analysis results made with Rubia tinctorum, it was determined that there were nine different dyestuffs, and the leading one of these dyestuffs was alizarin. The name “Alizarin” includes the Arabic suffix “al” (Enez, 1987). The amount of dyestuff (Alizarin) may vary depending on the geographical conditions in which the plant is grown (Karadağ, 1997). A wide variety of dyeing methods can be done with madder. The red color obtained depending on the substances added to the mordanting and dye bath shows a very wide range of color tones. For example, in a madder dyeing process with alum mordant, Yellowish Red is obtained, while with iron mordant, Brown Red is obtained. This dyestuff has also been used in medical treatments; For example, it has been seen in written sources as a treatment for diuretic, birth aid, vitamin C deficiency (Enez, 1987). In the dyeing process, dried and ground roots of the plant and mordant dyeing are used (Karadağ, 2007). Three different applications and processes of madder plant and wool yarn with mordant dyeing are presented in (Tables 3, 4, 5).

RESULTS

Dyeing Recipes and Application Procedures

Table 1. Mordanted wool yarn

Mordanting	Process
	20% alum based on the weight of the yarn is weighed on a precision scale and added to the mordanting bath. After the dissolution process, yarn is added. It is brought to boiling point. It is kept at 100 ^{0}C for 1 hour. The yarn is left to cool in the bath, then taken out of the bath and dried.

Table 2. Wool yarn dyeing process with daisy *(A. chia*) and madder (*R. tinctorum* L.)

Sample Painting	Dye plant	Ingredients	Painting color	Dyeing method	Dyeing temp.	Painting time
	Daisy (*A. chia*) and Madder (*R.tinctorum* L.)	Quercetin, Lutechin, Opryenin.	Orange	Mordant dyeing	100 ^{0}C	5 minutes
Process	The wool yarn is heated in a dyeing bath containing 50% of its weight of daisy and sufficient water. After boiling, wool threads are added, waited for 30 minutes, then removed, 3% madder is added and boiled for 5 minutes, then washed, rinsed and dried in the open air.					

Table 3. 1st Dyeing process of wool yarn with the root dye (*R. tinctorum* L.) plant

Sample Painting	Dye plant	Ingredients	Painting color	Dyeing method	Dyeing temperature	Painting time
	Madder (*Rubia tinctorum* L.) 1. Painting	Alizarin, Purpurin, Pseudopurpurin, Munjistin, Rubiadin.	Red	Mordant dyeing (15% alum and 5% cream of tartar)	85 ^{0}C	30 minutes
Process	(15% alum and 5% cream of tartar) is boiled for 1 hour and the wool yarn is mordanted for a day, and 100% of the madder and wool yarn of the 20% mordanted wool yarn are added simultaneously to the dyeing bath at room temperature and slowly heated. When the temperature reaches 85 ^{0}C, heating is stopped and left to cool in the dyeing bath for approximately 30 minutes. After cooling, the wool threads are taken, washed, rinsed and left to dry in the shade. "Turkish Red" and "Edirne Red" colors are produced on old carpets. Dyeing water is reused for the 2nd or 3rd dyeing.					

Table 4. 2nd Dyeing process of wool yarn with the Root Dye (*R. tinctorum* L.) plant.

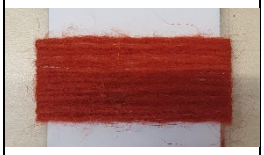
Sample Painting	Dye plant	Ingredients	Painting color	Dyeing method	Dyeing temperature	Painting time
	Madder (*R.tinctorum* L.) 2. Painting	Alizarin, Purpurin, Pseudopurpurin, Munjistin, Rubiadin.	Red	Mordant dyeing (15% alum and 5% cream of tartar)	85 ^{0}C	30 minutes
Process	1. Add the same amount of wool yarn to the dyeing bath in which the red color has been obtained by dyeing and start heating it. After it starts to boil, it is kept at 85 ^{0}C for 30 minutes. Then it is washed, rinsed and dried in the shade.					

Table 5. 3rd Dyeing process of wool yarn with the root dye (*R. tinctorum* L.) plant

Sample Painting	Dye plant	Ingredients	Painting color	Dyeing method	Dyeing temperature	Painting time
	Madder (*Rubia tinctorum* L.) 3. Painting	Alizarin, Purpurin, Pseudopurpurin, Munjistin, Rubiadin.	Red	Mordant dyeing (15% alum and 5% cream of tartar)	85 ^{0}C	30 minutes
Process	2. Add the same amount of wool yarn to the dyeing bath in which the red color was obtained by dyeing and start heating it. After it starts to boil, it is kept at 85 ^{0}C for 30 minutes. Then it is washed, rinsed and dried in the shade.					

CONCLUSION

In the research, herbal natural dyeing, which dates back to ancient times and has been applied but cannot be applied as frequently as it used to be due to the increasing use of synthetic dyes, was examined. Dyeing applications were carried out using traditional methods and recipes using various herbal dyes.

Applications have been made to woolen threads, which have an important place in traditional Turkish handicrafts and culture and are the main materials in weavings. Herbal dyes that give yellow and red colors were chosen.

In this direction, it is aimed to color wool yarns according to traditional dyeing techniques. Mordant dyeing studies, one of the methods used in natural dyeing, were carried out. The dyestuffs used are; for orange color dye; Daisy *(Anthemis chia)* and

Madder *(Rubia tinctorum* L.), red color dyes are used as Madder *(Rubia tinctorum* L.). In madder *(Rubia tinctorum* L.), red colors in different tones were obtained with 3 separate applications in the same dye bath. As a result of all these practices, it has been seen that dyestuffs, dyeing recipes and methods are very important for cultural heritage in terms of preserving dyeing recipes and methods, ensuring sustainability and transferring them to the future in order to continue traditional methods and practices. It is important to provide empowerment environments.

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