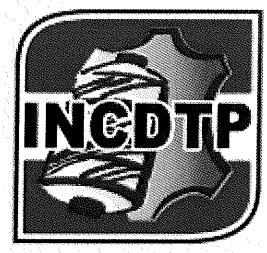

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TEXTILE RESEARCH – ACTIVE FACTOR FOR INCREASING PERFORMANCE AND COMPETITIVENESS

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DYEING OF CLONED SHEEP WOOLS USING DRIED LEAVES OF WALNUT, MINT AND SAGE

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Keywords: wool, natural dyeing, walnut, mint, sage, cloned sheep wool

Abstract: *Natural dyestuffs had been commonly used for dyeing of leather and textiles since prehistoric times. Use of natural dyestuffs started to lose its popularity right after invention of synthetic fibres. Natural dyestuffs are classified in two groups, animal and vegetable based dyestuffs. Vegetable originated dyestuffs are derived and extracted from fruits, roots, leaves, barks, and or seeds of plants. Animal originated dyestuffs are derived from the whole body of some insects. Nowadays natural dyestuffs are not preferred in vast production as it is for synthetic dyes. However increased awareness of environmental issues in recent years has positive influences on the use of natural dyestuffs. Some consumers are intentionally prefers natural dye used textile items even though their low degree of colour fastness properties and high prices. There have been many different researches about natural dyeing processes using mordant. In this study dried leaves of walnut, mint and sage have been used for wool dyeing. Wool fibres that have been used in this work are special fibres that are cut from cloned twin sheep in Veterinary Faculty of Istanbul University, Turkey. Different types of mordant are used as pre treatment and post treatment of naturally dyed wool fibres. Therefore three groups of dyed fibres are prepared as non mordant fibres, pretreated mordant dyed fibres and post treated mordant dyed fibres. Influence of mordant type on the colour of dyed fibres, colour efficiency of fiber types, and rubbing, washing, and light fastness degrees of specimens are evaluated. Among the cloned sheep fibres, there are not any difference has been observed in terms of fastness values and colour efficiency.*

1. INTRODUCTION

Natural dyes have started to be used in the organic textile products recently. Increasing environmental awareness, fashion trends and environmental regulations direct the textile dyers to build environmental friendly alternative dyeing processes. Growing demand of natural dyed textile materials has also caused increases on the number of academic works about natural dyeing materials and dyeing processes. [1-9] Natural dyeing processes require heavy metal containing salt, mordant, as additive for the dyeing process. Eight different types

of mordant that are used as binding agent, built bridge between dye molecules and fiber surfaces.

In his study wool fiber has been dyed using vegetable-based natural dyestuff of dried walnut leaves, mint and sage using nine different mordants. Wool that is used during the experimental dyeing process is gathered from the cloned sheep Oyali and Zarife. Cloned sheep are born in Istanbul University, Veterinary Faculty in November 2007[1]. Figure 1 shows the cloned lambs.

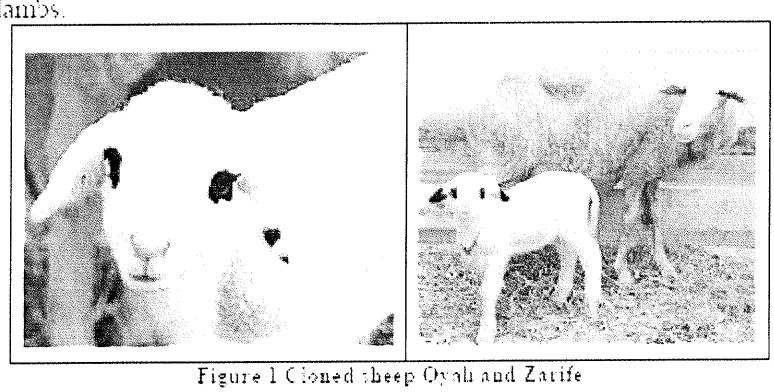

Figure 1 Cloned sheep Oyali and Zarife

2. EXPERIMENTAL PART

Three different groups of hand spun wool yarn samples are used in the experimental work. Two of the yarn samples are spun using greasy wool of cloned sheep of Oyali and Zarife (Figure 1) The other yarn sample is used as control specimen that is supplied by a local carpet yarn manufacturer.

Extract preparation

Dye extraction is prepared using boiling process at 100°C, for 60 minutes. Dried dye materials are weighed as the same weights of fiber weights. Appropriate amount of each material (walnut leaves, sage leaves and mint leaves) are boiled in the 25:1 liquid ratio of distilled water. Processed water-dye material extracts are then filtrated to remove residuals and other contaminations. Infiltrated extracts are then used during all dye processes.

Mordanting

In the experimental work plan eight different mordants were chosen: ferrous sulphate, calcium nitrate, copper sulphate, potash alum, potassiumbitartarate, caustic soda, potassiumdichromate. The amount of mordant material is calculated based on the weight of the specimen yarn. Mordant was taken as 3% of specimen yarn to be dyed in weight. The methods of dyeing employed were premordanting. In the premordanting method, the yarns were first immersed in an aqueous solution of each eight mordant of ferrous sulphate, calcium nitrate, copper sulphate, potash alum, potassiumbitartarate, caustic soda, potassiumdichromate

Dyeing

After the premordanting processes, all of mordanted and non-mordanted specimens are then dyed for 60 min. at 100°C in the aqueous medium of liquor ratio of 25:1.

Colour measurement :

[1] http://www.istanbul.edu.tr/duyuru/?page=print.news&inc_id=4152

Colour values were evaluated by means of K S and CIELAB colour difference values (illuminant D65 10 0 observer) on Datacolor spectrophotometer.

Fastness determination

Wash fastness test were carried out according to the A2S method. Wet and dry rub fastness measurements are carried out using manual crock meter, with 10 cycles

3. RESULTS AND DISCUSSION

In Figure 2, colours of dyed wool specimen that belongs to Oyali, are shown. Colours of sage and mint dyed specimens are found similar to each other where colours of walnut dyed specimens are found different. Walnut dyed specimens are found darker than the other specimens dyed with sage and mint. Influence of mordants is also shown in the Figure 2.

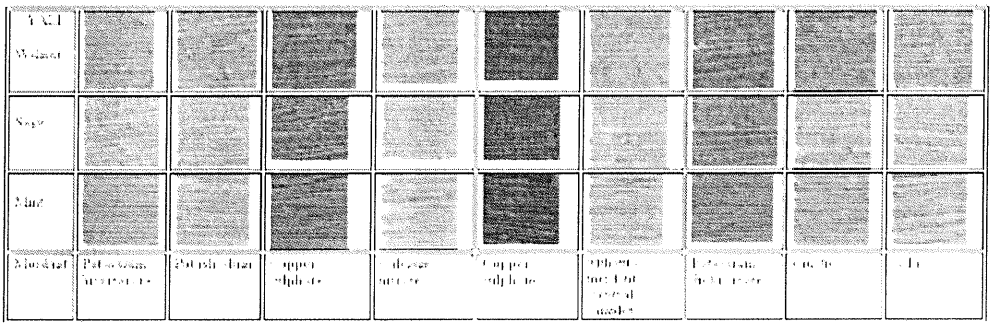

Figure 2 Colour of walnut, sage and mint leaves on the wool samples of Oyali

K S colour values of walnut dyed wool specimens are shown in Figure 3. Use of different mordants has similar influences on each three wool types.

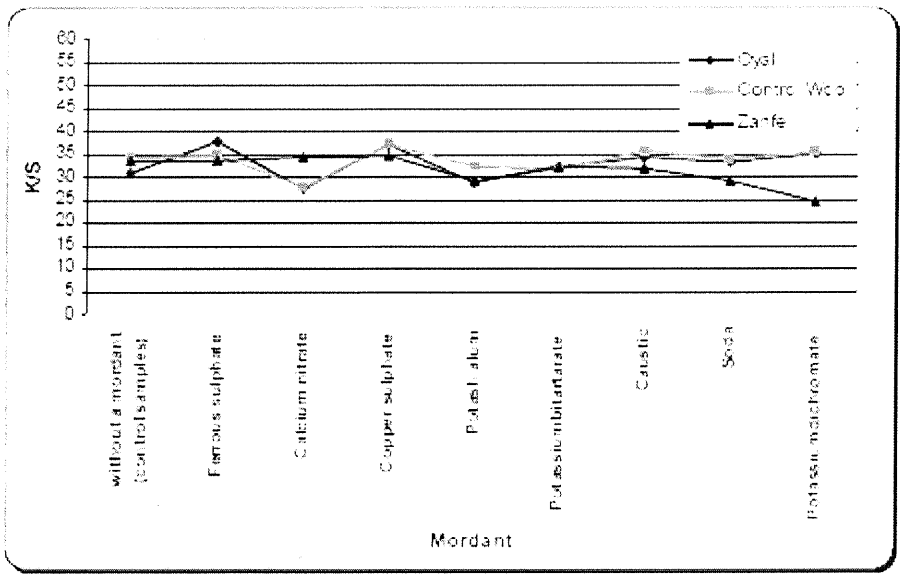

Figure 3 K S colour values for the specimens of Zanfel's wool, Oyali's wool and control wool

	Oyalı-Zarife	Oyalı-control	Zarife-control
	dE	dE	dE
without a mordant (control samples)	[illegible]	[illegible]	[illegible]
Ferrous sulphate	[illegible]	[illegible]	[illegible]
Calcium nitrate	[illegible]	[illegible]	[illegible]
Copper sulphate	[illegible]	[illegible]	[illegible]
Potash alum	[illegible]	[illegible]	[illegible]
Potassiumbitartarate	[illegible]	[illegible]	[illegible]
Caustic	[illegible]	[illegible]	[illegible]
Soda	[illegible]	[illegible]	[illegible]
Potassiumdichromate	[illegible]	[illegible]	[illegible]

Table 1. dE colour comparisons for the specimens of Zarife : wool, Oyalı : wool and control wool.

In the Table 1 dE colour differences values of each wool group are compared with each other. The highest dE difference is found between specimens dyed with mordants of Calcium nitrate and Potassiumdichromate for the comparison of wool types Oyalı and Zarife.

dE values of specimens are shown in the graphs of L, a, b in Figure4. Colour differences of each three types of wool are found parallel to each other when comparing the influences of different eight.

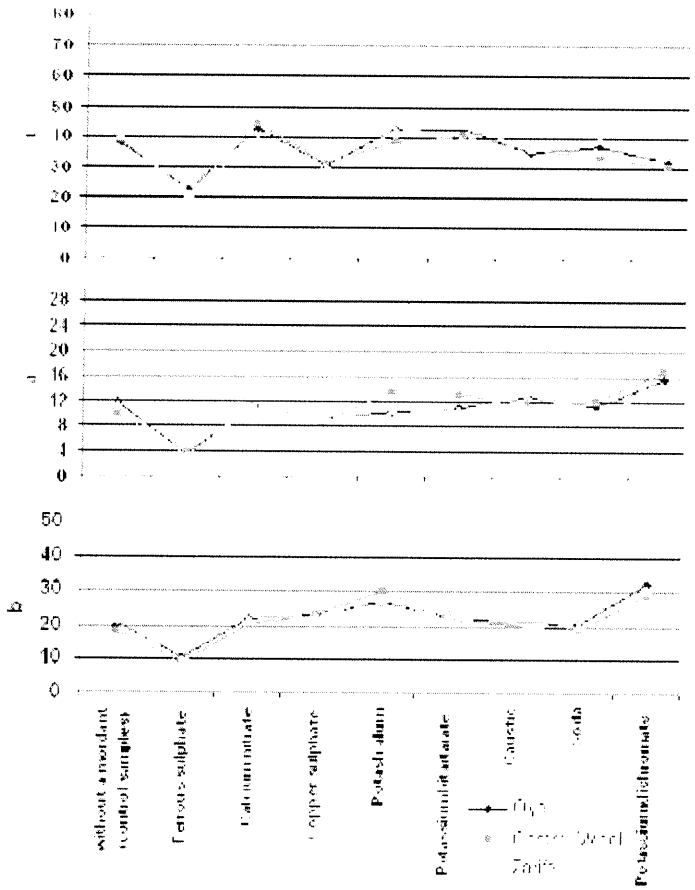

Figure 4. L, a, b values of walnut dyed wool specimens.

	Oyalı		Zarife		Control Wool	
	Dry	wet	Dry	Wet	Dry	Wet
without a mordant (control samples)	4	3	4-5	3	4	3
Ferrous sulphate	4	4-5	3-4	3-4	4	3
Calcium nitrate	4	3	4	2-3	4	4
Copper sulphate	3-4	3	3-4	2-3	4	4
Potash alum	3-4	2-3	4	2-3	4	4-5
Potassiumbitartarate	4	2-3	4-5	2-3	4-5	3
Caustic	4	3-4	5	3-4	4-5	4
Soda	4	3	4-5	4	4-5	3-4
Potassiumdichromate	3-4	3	4	3	3-4	4

Table 2 Rubbing Fastness values of walnut dyed wool specimens

	Oyalı		Zarife		Control Wool	
	Staining on Wool	Staining on Cotton	Staining on Wool	Staining on Cotton	Staining on Wool	Staining on Cotton
without a mordant (control samples)	4	4-5	4	4-5	4-5	4-5
Ferrous sulphate	4-5	4-5	4-5	4	4	4-5
Calcium nitrate	4-5	3-4	4-5	3-4	4	4
Copper sulphate	4-5	4	5	4-5	4-5	4
Potash alum	3-4	4	3-4	3-4	4	3-4
Potassiumbitartarate	4-5	4-5	4-5	4	4-5	4-5
Caustic	4-5	4	4-5	4	4-5	4-5
Soda	5	4-5	5	4-5	4-5	4
Potassiumdichromate	4-5	4	4-5	4	4-5	4-5

Table 3 Washing Fastness values of walnut dyed wool specimens

Results of rubbing fastness and washing fastness values of walnut dyed specimens are shown in Table 2 and Table 3 respectively. Mordant types of ferrous sulphate, caustic and soda are found giving highest level of washing and rubbing fastness values considering both wet and dry rubbing conditions.

4. CONCLUSIONS

Wool samples that are coming from cloned sheep of Oyalı and Zarife are found giving similar results considering influence of different dye materials - walnut, sage and mint leaves; different types of mordant, and their fastness properties.
Colours of walnut leave dyed specimens are dyed mostly in the range of brown, where sage and mint leaves dyed specimens are found in mostly khaki colours.

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