

Preparation of Dyeing Prescription and Investigation of Natural Hair Dyeing Properties of Walnut (*Juglans regia* L.), Logwood (*Alnus glutinosa* L.), Alkanet (*Alkanna tinctoria* L.) Madder red (*Rubia tinctorum* L.) and Wouw (*Reseda luteola* L.) Extracts

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In this work, the root of madder red (*Rubia tinctorum* L.), leaves of logwood (*Alnus glutinosa* L.), coco and leaves of walnut (*Juglans regia* L.), seeds and leaves of wouw (*Reseda luteola* L.) were extracted in deionized water after dried and bindered. These solutions were used portion of 100 mL and various transtion element's salts were added (FeSO_4 , CoCl_2 , $\text{KAlSO}_4 \cdot 12\text{H}_2\text{O}$, AgNO_3). Each of them evaporated to 50 mL and 1 mL of almond oil was added into each of samples. Human hairs prepared before, by adding to this dye pat, the dyeing time was determined. According to the this results, for madder red- CoCl_2 5.3 h and chestnut clour; for wouw- $\text{KAlSO}_4 \cdot 12\text{H}_2\text{O}$ 6 h and rofle yellow; for walnut- $\text{KAlSO}_4 \cdot 12\text{H}_2\text{O}$ 6 h, FeSO_4 6 h and pale chestnut, for madder red- CoCl_2 6 h and redhead; for common alder walnut- FeSO_4 7.5 h and dark chestnut; for walnut- FeSO_4 8.30 h and dark chestnut; for common alder-walnut - FeSO_4 8 h and black;for walnut- FeSO_4 6.3 h and nut shell. Same dyeings were made for each samples in oven at 40 °C and dyeing periods were determined as 4, 3.45, 2.40, 2, 2.30, 3.50, 2.50, 3.25 h, respectively.

Key Words: Madder red, Logwood, Wouw, Walnut, Hair, Mordant.

INTRODUCTION

People have been using hair dyes for long time. Today, they have been using the natural hair dyes, beside of synthetic dyes. For this purpose, juglan, reseda luteola, henna *etc.* have been prefered. Natural dyes have little organic molecules. Thus, diffusion to the shell of the hair is easy according to the synthetic dye molecules and makes hair brighter. However, natural dyes need more application period since synthetic dyes¹.

In addition, according to the literature survey, some toxicological effects on the human health have been determined for synthetic hair dyes²⁻⁴.

According to the literature studies no report has been published. Therefore, we have investigated the preparing of the prescription and determininig of the dyeing properties of some plants walnut (*Juglans regia* L.), logwood (*Alnus glutinosa* L.), wouw (*Reseda luteola* L.), alkanet (*Alkanna tinctoria* L.) and madder red (*Rubia tinctorum* L.).

EXPERIMENTAL

In present studies, walnut leaves and cocoon, root of madder red, logwood leaves, wouf flowers and root of alkanet were used as dyeing source. These plants were picked-up in September 2007, in Tokat city-Turkey. After picked-up they were dried in shadow and powdered.

Human hair was assured from hairdresser which has 5-8 cm length and light. FeSO_4 , CoCl_2 , AgNO_3 and $\text{KAlSO}_4 \cdot 12\text{H}_2\text{O}$ were used as mordant. Deionized water, ethyl alcohol (95 %) were used extraction solution and almond oil was used as hair care. The colour codes were determined using Pantone Colour Guide. Moreover, wash-fastness were established according to DIN 54021 and to ISO 105-C06, CIS, respectively⁵.

Extraction procedure: Each of powdered plant material (20 g) putted in Soxhlet apparatus and extracted with 300 mL of deionized water and alcohol. After 6 times reflux (until colourless), this solution was used as dye bath.

Dyeing procedure: Concentrated dye bath (30 mL), mordant (0.3 g) and human hair (0.5 g) were mixed and heated at room temperature for each samples. Dyeing time, colour codes and washing fastness were determined. This procedure was repeated for 40 °C for each experiment.

The experiments carried out can be given as below:

- (1) Logwood (10 g) + walnut leaves (10 g) + FeSO_4 (1.5 g)
pH: 5.50; Colour: Dark; Colour code: 18-0920
- (2) Madder red (10 g) + CoCl_2 (0.5 g)
pH: 4.00; Colour: Chestnut; Colour code: 18-1140
- (3) Madder red (20 g) + CoCl_2 (0.5 g)
pH: 4.14; Colour: Violet; Colour code: 18-1230
- (4) Madder red (5 g) + Alkanet (5 g) + AgNO_3 (0.5 g) + CoCl_2 (2 g)
pH: 5.45; Colour: Violet-brown; Colour code : 19-1228
- (5) Wouf (10 g) + $\text{KAlSO}_4 \cdot 12\text{H}_2\text{O}$ (1 g)
pH: 5.15; Colour: Rofle yellow; Colour code: 18-1142
- (6) Walnut leaves (20 g) + FeSO_4 (5 g) + H_2SO_4 (0.1 mL)
pH: 3.50; Colour: Natural dark; Colour code : 19-1137
- (7) Walnut leaves (15 g) + FeSO_4 (2 g)
pH: 4.05; Colour: hazel-nut shell; Colour code: 19-1137
- (8) Walnut (15 g) + Wouf (5 g) + $\text{KAlSO}_4 \cdot 12\text{H}_2\text{O}$ (0.5 g) + FeSO_4 (0.5 g)
pH: 4.50; Colour: Light brown; Colour code: 17-1147

Dyeing conditions and colour codes of dyed hair samples are given according to the experiment sequence (Table-1).

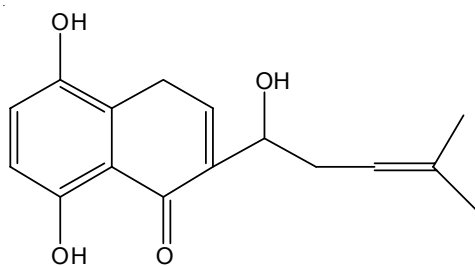
TABLE-1
DYEING CONDITIONS AND COLOUR CODES OF DYED
HAIR SAMPLES AT ROOM TEMPERATURE

Exp. no.	pH	Time (h) / Room temp. 40 °C	Wash fast (shamp.)	Wash fast (soop)	Colour code (TP)	Colour
1	5.50	8.00 / 4.00	5	5	18-0920	Kangaroo
2	4.00	7.50 / 3.45	4.5	5	18-1140	Mocha bisque
3	5.50	6.00 / 2.40	2-3	4	18-1230	Cocomut
4	4.00	5.30 / 2.00	2	3-4	19-1228	Root beed
5	4.15	6.00 / 2.40	4-5	5	18-1142	Leather brown
6	3.50	8.30 / 3.30	5	5	19-1137	Chestnut
7	4.05	6.50 / 2.50	2-3	3-4	18-1137	Raw hide
8	8.00	4.50 / 3.25	5	4-5	17-1147	Amber brown

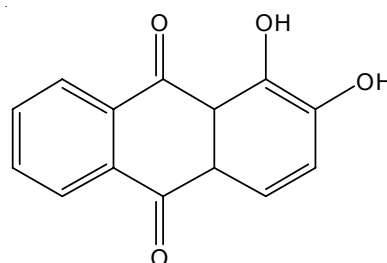
RESULTS AND DISCUSSION

The reason of collection of these plants is depend on the textile study by this research group^{5,6}. Walnut for brown, logwood for dark, wouw for yellow, alkanet for dark-brown and madder red for violet were preferred. At the choosing of the mordants, experimental experiences were taken into consideration.

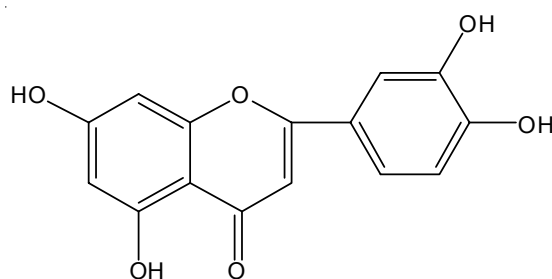
The plants used in this studies have dyestuff molecule as given below⁷. Juglon in walnut, tannin in logwood, luteolin in wouw, alkannin in alkanet, alizarin in madder red, mainly.



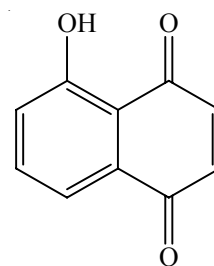
Alkannin



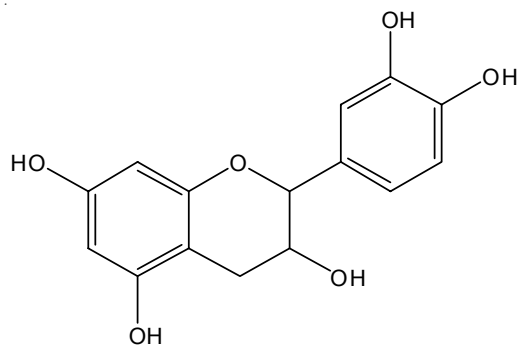
Alizarin



Luteolin



Juglon



Tannin

The influence of mordant, dyestuff and hair molecules can be given as below.

Oxochrome group of dyestuff.....Mordant cation.....Hair molecules

Here, the coordinative bonds are formed between the oxochrome group (-OH, =O) of dyestuff and free amino (-NH₂) and carboxyl group (-COOH) of hair molecule. These are called as inner complex. The reason of mordant usage is to obtain the different colours.

As seen Table-1, dyeing periods at room temperature are very long and is not suitable as practice. However, when we compare the dyeing period for dyed samples at room and 40 °C, the dyeing periods decrease to half at 40 °C approximately. Because, as it was known that the formation of chemical bond and bond breakage are carried out increase of the temperature. As a result it may say that dyeing periods of the hair samples at 40 °C may be deliberated as practise.

Washing fastness for experiment of 3, 4 and 7 seem to be lower than others. However, experiment of 1, 2, 5, 6 and 8 have good fastness degree. Consequently, this study is important with respect to cosmetic production and hence, these plants will be able used in another important area.

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