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Extraction of Tannins from Henna (*Lawsonia L. inermis*) Leaves

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Abstract

This study was conducted to determine the main compounds of Henna are: Quinine, lawson naphoquinone, resin, gallic acids, glucose, manitol, and the tannins, which the main material in our work. The tanning materials were extracted with water as a solvent at a temperature of 40C°. The average tannins content were determined and were found to be 11.2% on weight basis. The type of tannins was identified to be condensed type of tannins. The components of Henna were determined through thin layer chromatography. The dried powder and the extract solution were applied separately for retannage of leather. The results showed that the raw powder gave leather with good physical and chemical properties, while that retanned with the extract solution gave leather with poor physical and chemical properties.

Introduction

Henna is a perennial evergreen shrub indigenous to southern west. Asia and grows widely in tropical and subtropical areas. Most of this plant contains tannins have been used for medicinal purposes. The importance of many medicinal plants is attributed to certain chemical compounds that have certain physiogical effects on the human body. Examples of such include alkaloids, glycosides, saponins, resins, flavanoids, tannins, volatile, fixed oils, and gums. Plant associated with the indiscriminate use of synthetic drugs and antibiotics synthetic, dyes and cosmetic. Henna is a perennial evergreen shrub indigenous to southern west Asia and grows widely in tropical and subtropical areas. In the Sudan it is cultivated commercially in the River Nile and the Northern states. Henna is a small tree with grayish brown bark, leaves,-opposite sub sessile elliptic, flowerers-numerous, small rose colored, fragrant, in large terminal pyramidal penciled cymes, capsule globose, about size of apea, with numerous, pyramidal, smooth seeds. It is widely cultivated in tropical regions of the world in Sudan, Egypt, China and India. The coloring compound in Henna leaves is quinine contains lawson, naphoquinone, resin tannins, gallic acids, glucose and

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manitol. And produces burgundy dye molecule this molecule has an affinity for bonding with protein and thus has been used to dye skin hair leather and wool. Henna is also used for treatment of skin problems and in cosmetics. Medicinallys used as antibacterial and antifungal. Henna flowers have been used to create perfume and give an essential oil. The roots are bitter, refrigerant, diuretic and are useful in curing, burning, sensation, leprosy, skin disease and amenorrhea [1]. The scientific Classification Kingdom: Plantae Divisio: Magnoliophyta, Class: Magnoliopsida, Order: Myrtales, Family: Lythraceae Genus: Lawsonia Species: L. inermis. The tannins are classified into true and pseudo tannins. True tannins are complex phenol compounds of high molecular weights of about 5000 to 30000. These can be sub classified into hydrolysable, condensed and complex tannins [2]. Hydrolysable tannins (pyrogallol) are esters of sugar with single or mixture of polyphenolic carboxylic acids, the esters in these with single or mixture of polyphenolic carboxylic acids, the esters in these tannins are readily hydrolysed by the action of acids, alkalis or enzymes such as tannase. Tannins are formed from several molecules of phenolic acid such as gallic and hexahydroxy diphenic acids. These are united by ester linkages to central glucose molecules [1]. Hydrolysable tannins are common in number of families including the *Myrtaceaae, Hamamelidaceae, Punicaceae and Rosaceae* [3]. Condensed tannins (proanthocyanidins) contain phenolic molecules only [4]. Most tannins of this type are formed by the condensation of two or more molecules of flavan-3-4-diols such as catechin (1) and epicatechin (11) or the mixture of the two [5]. Condensed tannins un- like hydrolysable tannins are not readily hydrolysable to simpler molecules and do not contain sugar moiety .They are related to flavonoid pigment and have polymeric flavan-3-ol structure (usually di and trimer). Condensed tannins are converted into red insoluble compounds known as phlobaphenes, which do not undergo hydrolysis in acid or base. Condensed tannins are small polymers and are common in families such as Wattle, Gambier *and* Henna leaves. Pseudo tannins are simple phenolics that give some of the tests for tannins but not precipitate by gelatin. Complex tannins are biosynthesized from both hydrolysable and condensed tannins [6]. Vegetable tannins and bitter substances present in barks, fruits, leaves and seeds. They are used as tanning materials, which can be defined as one of the group of complex organic chemical produced by plants. Although tanning materials are found in all parts of the world, only those which are of commercial importance with high tannins content are widely used. In this work samples of Henna leaves were dried, crushed and extracted in a Soxhlet extractor with water at 40°C. Then used to determine the type of tannins the result of the analysis are shown in table1. Two pieces of sheep skin were soaked, limed, unhaired, delimed, batied, pickled; chroeme tanned and retanned these skins were retanned one with the extract and the other with the powder of Henna leaves. The retannied pieces of skin one were inspected for physical and chemical properties as shown in tables 2,3 and 4. Thinlayer Chromatography (TLC) using the solvent system Toluene: Ethyl acitate: Formic acid (5:4:1) showed that Henna leave has numbers of compounds as shown in table 5.

Materials and methods

Henna leaves were collected during the period of (Mach-April) from Elkadrow area (Khartoum state), then dried in a dark place at room temperature dried leaves were powdered using an electric crushing device unit then passed through a 40 mesh sieve. Samples were dried, milled and extracted with water in a Soxhlet extractor until clear liquid was obtained.

Chemicals and reagents

95% Purity methanol, o.1M solution iodine, 4% solution sodium hydroxide, 4% solution sodium thiosulphate, 4% solution sulfuric acid, 1% solution gelatin, starch, 5% solution ferric chloride, toluene solution, ethyl acetate purity, formic acid solution, butanol purity, acetic acid solution, water, $60F_{254nm}$ silica gel, acid mixture (11.5 ml $HCLO_4$+3.5ml conc. H_2SO_4+5ml conc. HNO_3), 10% KI solution (10gm in 100ml), starch indicator, 0.1 N thio-sulphate solution (standardized), toluene: Ethyl acetate: Formic acid (5:4:1) and butanol: Acetic acid: Water (5:3:3).

Table 1: Identification of tannins.

	Gelatin test	Ferric chloride test
	1ml of 1% solution of gelatin was added to 25 ml of Henna tannins solution	1ml of 5% ferric chloride solution was added to 25ml of Henna solution
Observation	**Precipitate the tannins**	**Brownish green color**

Each sample was tested for three times this confirms that the type of tannins is a condensed type.

Table 2: Physical analysis: Leather retained with Henna powder:

Parameter	Result	BIS norms*
Tensile strength (Kg/cm^2)	257.32	250
Elongation at break (%)	58	60-70
Load at grancrack (Kg)	20.8	20

Table 3: Physical analysis: Leather retanned Henna extract:

Parameter	Result	BIS norms*
Tensile strength (Kg/cm^2)	200	250
Elongation at break (%)	56	60-70
Load at grancrack (Kg)	20.0	20

*Bureau of Indian Standards (BIS) specification for chrome retanned upper leather.

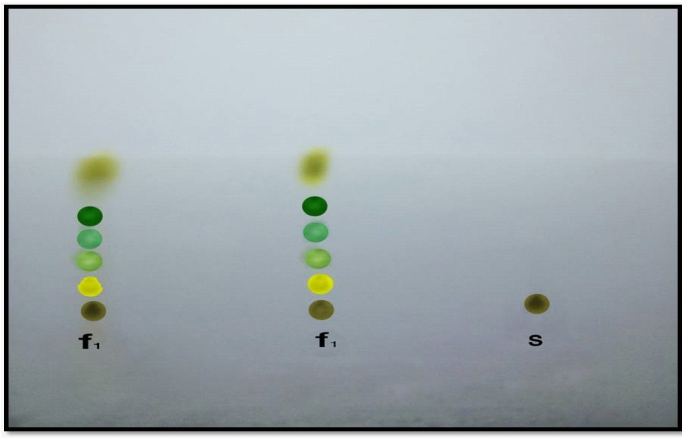
Table 4: Chemical Analysis.

Type of leather	Ash%	Moisture	Cr_2O_3 %
Retanned with Henna raw Powder	3.8	9.5	1.65
Retanned with Henna extract solution.	3.3	9.7	1.24

Chromatographic results: R_f Value of Standard Tannins = 0.77

Table 5: Rf values and colors of separated compounds of Henna extract with n-hexane.

Separated compounds	Color	R_f
1	Brown	0.76
2	Yellow	0.63
3	Pale Green	0.58
4	Dark Green	0.48
5	Purple	0.35
6	Green	0.23



Appendix (1)

S: Sample of Tannins; F1: n-hexane fraction

Discussion

Thin Layer Chromatography (TLC) using the solvent system Toluene: Ethyl acitate: Formic acid (5:4:1). Showed that Henna leaves have numbers of compounds. The analysis showed that Henna has high tannins content which reaches about 11.2% on weight basis; this is in agreement with previous work [7]. It is seen from the precipitation of gelatin and brownish color of ferric chloride, that Henna is a condensed type of tannins in agreement with [3]. Hence it was decided to apply Henna as a retaining agent. There were two procedures for application one which used raw Henna leaves powder and other that Henna extracts. The reasons of using either procedure depend on the quality of the leather produced, the cost and protection of the environment. Upon the application of these procedures, it was found that the leather produced using the raw powder is full, soft with better appearance compared quite well with the standard values. The other method gave a thin, empty, loose grain leather and comparatively low tensile strength than the standard. Therefore it is advisable to use raw Henna powder than extract solution. It must be noticed that the husk of the leaves gave no problem to discharge the spent solution to the drain and that Henna has no effect on the environment and drainage.

Conclusion and recommendation

Series of experiments covering analysis, leaching, powdering and retannage were carried out using both Henna powder and extract solution. The same was applied in retannage of wet-blue sheep skin and the two lots were dried. Physical and chemical testing shown in the tables 2,3 and 4 were performed .It is concluded that the powder gave a leather with good physical properties, but those leather that were retanned with the extract gave an empty and low quality leather. It is also concluded that the powder has no effect the drainage.

Further work needs to be carried out on leaching a blend of Henna. The extract obtained may give an extract of high quality due to the presence of condensed tannins in Henna. Garad pods are admixture of hydrolysable and condensed tannins and therefore blending it with Henna would increase the ratio of condensed tannins leading to abettor tanning extract.

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