

Dyeing Effect of Colour Obtain From Bark of *Morus Alba* on Selected Fibers

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ABSTRACT

In present study *Morus alba* bark was used, for the extraction of the natural dye material. Aloe vera juice was selected as natural mordant to standardize the dyeing effect of *Morus alba* bark's dye on natural and synthetic fibers. Natural dye was formulated with *Morus alba* dye and natural mordant. Aloe vera juice in the ratio 2:10, 5:10 and 10:10 and the effect was compared with synthetic mordant namely copper sulphate, lead acetate and potassium dichromate with *Morus alba* bark's dye in the ratio 10:1. Natural dye with Aloe vera juice in the ratio 10:10 shows a good dyeing effect on the animal fibers when compared to plant or synthetic fibers. The natural dye with Aloe vera juice in the ratio 10:10 was subjected to skin irritation study and the result showed no skin irritation, erythema or edema.

Keywords: *Morus alba*, *aloe vera*, *erethyma*.

INTRODUCTION

Natural dyes are derived from naturally occurring sources such as plants (e.g., indigo and saffron); insects (e.g., cochineal beetles and lac scale insects); animals (e.g., some species of mollusks or shellfish); and minerals (e.g., ferrous sulfate, ochre, and clay) without any chemical treatment¹. A spectrum of beautiful natural colours ranging from yellow to black exists in the above sources. These colours are exhibited by various organic and inorganic molecules (pigments) and their mixtures are due to the absorption of light in the visible region of 400-800 nm. This absorption of light depends on the structure or constituents of the colouring pigment/ molecules contain various chromophores present in the dye yielding plant to display the plethora of colours². The use of natural products together with their therapeutic properties is as ancient as human civilization and for a long time, mineral, plant and animal products were the main sources of drugs³. The current preference for naturally derived colorants is due to their healthfulness and excellent performance. Several synthetic colorants have been banned because they cause allergy-like symptoms or are carcinogens. Nowadays, natural dyes are commonly used in the cosmetic industry due to no side effects, UV protection and anti-aging properties. In India, there are more than 450 plants that can yield dyes⁴. In addition to their dye-yielding characteristics, some of these plants also possess medicinal value. Bark of *Morus alba* contain large amount of tannins hence can be used as dye.

MATERIAL AND METHOD

Collection and authentication of plant

The plant part (bark) was collected from local village of Kullu district, Himachal Pradesh, India in month of March 2016. The plant & bark was identified & authenticated at Botany department with specimen.

Preparation of dye

150 gm of freshly collected bark were dried in hot air oven and powdered. The powdered *Morus alba* bark was subjected to aqueous extraction. The extracted dye solution was evaporated to 1/10th volume under controlled temperature.

Selection of mordant⁵

Synthetic mordant- Copper sulphate, lead acetate and potassium dichromate.

Natural mordant- Dried juice of Aloe vera¹

Selection of fibres

Vegetable origin- Cotton and jute.

Animal origin- Silk and wool.

Synthetic origin- Nylon.

Human hairs- From Saloon.

Human hairs were bleached and made white for viewing the colouring effect of dye.

Selection of synthetic and semi-synthetic hair dye

Synthetic hair dye containing para-phenylenediamine (natural black).

Semi-synthetic hair dye containing bhrinraj, methi, henna, hibiscus (henna herbal hair colour).

Extraction of Aloe vera juice

Freshly leaves of Aloe vera were collected and washed thoroughly. The outer green surface was peeled off and the linear white mass was collected. 150 gm of the collected material were crushed to a semi-solid consistency which was subjected to filtration. 50 gm of filtrate was subjected to evaporation to 1/10th of its volume under controlled temperature.

Formulation of natural dye with mordant

Morus alba bark dye in 4 batches of 10 ml each was prepared and mixed with Aloe vera juice, copper sulphate, lead acetate, and potassium dichromate respectively.

The natural hair dye containing Morus alba bark dye with various concentration of selected natural and synthetic mordant were subjected to staining process with specific fibres. It reveals that the colouring effect of the Morus alba bark dye without mordant was poor in natural fibres, without any visible physical damage.

Skin irritation study⁶

Draize modified scoring technique was used to perform the skin irritation study at 24 hours for

seven days on healthy volunteer (i.e. on Director, Principal and 3 H.O.Ds). The dorsal surface of the skin was cleared by shaving. Natural dye (Morus alba bark dye) was applied over the skin and observed for skin irritation, erythema, and edema formation.

RESULT AND DISCUSSION

It can be inferred from Table No. 1, 2, 3 that the natural dye (Morus alba bark dye) with synthetic mordant caused physical appearance damage to the fibres and the colouring effects was ranging from poor to moderate. The natural dye with natural mordant causes no physical damage to the fibres and the colouring effects was good. No irritation, edema was observed during irritation study

SUMMARY AND CONCLUSION

Morus alba bark dye with natural mordant Aloe vera juice in the ratio 10:10 produced significant dyeing effect when compared to synthetic hair dye. The natural dye was considered to be a better dyeing agent and also did not cause any physical damage to the fibre. The present study had laid a foundation for the development of natural dye which is eco-friendly, biodegradable and with no toxic effect. This natural dye can be used in textile industry, cosmetics industry (hair dye) and handy crafts and small scale industry.

Table 1: Colouring effect of Morus alba dye without mordant

Fibre	Duration of exposure	Physical appearance of fibre after applying Morus alba bark dye	Colouring effect of Morus alba bark dye	
			Before washing	After washing
Cotton	1 Hour	Moderate	Good	Moderate
Jute	1 Hour	Moderate	Good	Moderate
Wool	1 Hour	Good	Very Good	Good
Silk	1 Hour	Good	Good	Moderate
Nylon	1 Hour	Good	Good	Moderate
Human hairs	1 hour	Good	Good	Good

Table 2: Study on the colouring effect of natural dye with mordant on selected fibres

Fibre	Mordant	Colouring effect		Physical appearance	Duration of treatment
		Before Wash	After Wash		
Cotton	Aloe Vera	Good	Moderate	Good	30 minutes
	Copper sulphate	Good	Moderate	Good	30 minutes
	Lead acetate	Good	Good	Damaged	30 minutes
	Pot. Dichromate	Good	Good	Damaged	30 minutes
Jute	Aloe Vera	V. Good	Good	Good	30 minutes
	Copper sulphate	Moderate	Poor	Damaged	30 minutes
	Lead acetate	Good	Moderate	Damaged	30 minutes
	Pot. Dichromate	Good	Moderate	Damaged	30 minutes

Wool	Aloe Vera	V. Good	Good	Good	30 minutes
	Copper sulphate	Moderate	Poor	Good	30 minutes
	Lead acetate	Moderate	Moderate	Good	30 minutes
	Pot. Dichromate	Moderate	Poor	Damaged	30minutes
Silk	Aloe Vera	Good	Moderate	Good	30 minutes
	Copper sulphate	Moderate	Poor	Good	30 minutes
	Lead acetate	Good	Moderate	Good	30 minutes
	Pot. Dichromate	Moderate	Poor	Damaged	30 minutes
Nylon	Aloe Vera	Good	Moderate	Good	30 minutes
	Copper sulphate	Good	Good	Good	30 minutes
	Lead acetate	Moderate	Good	Damaged	30 minutes
	Pot. Dichromate	Good	Good	Damaged	30 minutes
Human Hairs	Aloe Vera	Good	Moderate	Good	30 minutes
	Copper sulphate	Good	Good	Good	30 minutes
	Lead acetate	Moderate	Good	Damaged	30 minutes
	Pot. Dichromate	Good	Good	Damaged	30 minutes

Table 3: Comparison of colouring effect of natural dye (Morus alba bark dye) with marketed brands on Whit human hair

Name of the hair dye	Colouring effect		Duration of exposure	Physical appearance
	Before washing	After washing		
Morus alba bark dye + Aloe vera juice.	Good	Good	30 minutes	Good
Semi-synthetic hair dye. Henna herbal hair colour.	Good	Good	15 minutes	Cortex Damaged
Synthetic hair dye. (paraphenylenediamine)	Very good	Very good	15 minutes	Cortex Damaged

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