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FORMULATION AND EVALUATION OF HERBAL HAIR DYE

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ABSTRACT

Herbal medicines are plant derived materials or product with therapeutic or other human benefits which contain either raw or processed ingredients from one or more plants. Herbs are used in various cosmetic formulations such as herbal shampoo, herbal tablets, herbal hair dye, herbal toothpaste etc. In comparison to natural hair dyes, synthetic hair dyes are reported to cause skin and other skin related diseases. The main and objective of present study is formulation and evaluation of herbal hair dye. In this study dried alcoholic extracts of henna, indigo, amla, bhringraj, myrobalan and tea decoction in different concentration are used for six hair colorant formulations. The brown colour retaining power of human hair of each formulation retained for 30 days at room temperature. In sun light, the colour stain of human hair faded gradually. Washing of coloured human hair with mild shampoo on alternate days affect the stain of human hair. Out of six hair colorant F-1,F-2,F-3,F-4,F-5 and F-6.F-2,F-3 obtained better colorings effect on human hair when compare to F-1,F-4,F-6.The dark brown colour capacity of formulation F-5 was maximum. This due to the higher proportions of henna and synergistic effect of other plant extract.

KEYWORDS: Hair dye, henna, indigo, amla, bhringraj, myrobalan.

INTRODUCTION

In comparison to natural hair dyes, synthetic hair dyes are reported to cause skin and other skin related diseases. The manufacturing process is hazardous to health of the people involved in the process and its applications leads to environmental pollution and also causes potential side effects to the consumers of the product. The fear of side effects from the synthetic dyes has limited its use by health conscious customers throughout the world and has to overcome various regulatory barriers before it reaches its destination.[1]

Hair dyes formulations include dyes modifiers, antioxidants, alkalizers, soaps, ammonia, wetting agents, fragrance, and a variety of other chemicals used in small amounts that impart special qualities to hair such as softening the texture or give a desired action to the dye. The chemicals that are normally used in the dye are amino compounds (4-amino-2-hydroxytoluene and m-Aminophenol). Metal oxides, such as titanium dioxide and iron oxide, are also often used as colorants in the process.[2] Colorants are classified as being temporary or permanent. In temporary coloring the color can be washed from hair easily. Permanent coloring of hair involves addition of aromatic diamine or hydric phenols or polycompounds such as para phenylenediamine in the formulation. Continuous usage of such compounds containing dye on natural hair causes so many side effects such as skin irritation, erythrema, loss or damage of hair and skin cancer. Other chemicals used in hair dyes act as modifiers, which stabilize the dye pigments or otherwise act to modify the shade. Antioxidants protect the dye from oxidizing with air. Most commonly used is sodium sulfite. Alkalizers are added to alter the pH of the dye formula, because the dye works best in a highly alkaline milieu. Ammonium hydroxide is a common alkalizer. Apart from these basic chemicals, many other chemicals are used to impart special qualities to a manufacturer's formula. In order to color human hair by oxidative dye technology, the hair is generally treated with a mixture of oxidative hair coloring agents and an oxidizing agent. Hydrogen peroxide is the most commonly used oxidizing agent. However, in addition to oxidizing the oxidative coloring agents, hydrogen peroxide treatment of the hair can also solubilise and decolorize the colored melanin component in the hair, which can lead to undesirable hair qualities, such as brittleness and hair damage.[3]

Composition of herbal dyes and hair coloring mordant can be used to deliver a variety of hair colors to the hair. However, substantial improvement is needed in the areas of color saturation, color development, precise initial color consistency, improved wash fastness,

improved hair conditioning without causing hair damage and skin irritation. Because of the manufacturing hazards, environmental pollution, its side and toxic effects there is a vital need for an alternative to the existing black dye. These limitations of the chemically derived dye can only be overcome by replacing the constituents in the composition, by nontoxic ingredients derived from herbal resources.[3] So different herbs like Madayantika, Bhringraj,Amla,Nilini,Aloes,Chamomile,Shoeflower,Madder,Henna,Indigo are used for safe herbal Hair dye formulation.[4,5,6,7,8,9]

MATERIALS AND METHODS

Processing of Plant Materials

1. Plant Collection

The leaves, fruits and whole plant of herbs collection was done in the month of January -2019 in Kumarapalayam and identified by pharmacognosy department in JKKN College of pharmacy.

Plant Drying and Size Reduction

- A bulk quantity of leaves of henna & indigo, fruits of amla & myrobalan and whole plant parts of bhringraj was collected and cleaned.
- The plant material are dried at room temperature for about 15 days.
- After thoroughly dried, the plant material are powdered and powder was stored in air tight container

MATERIALS REQUIRED

- Dried leaves henna & indigo, fruits of amla & myrobalan and whole plant parts of bhringraj
- Ethanol

Extraction Process[10]

Pre fermentation “cold soaking” or “cold maceration” is a way to extract color from the skins or leaves stoppered container with the solvent and allowed to stand at room temperature for a period of at least 3 days with frequent agitation until the soluble matter has dissolved. The mixture then is strained, the marc (the damp solid material) is pressed, and the combined liquids are clarified by filtration or decantation after standing and evaporate to get dried powdered form.

Procedure for the Preparation of Herbal Hair Dye

The quantities of above mentioned dried extracts of all in gm and tea decoction were taken as mentioned in Table 1. All the extracts of above mentioned plants are mixed in sufficient quantity (25ml) of ethanol to prepare uniform viscous pastes.

Table 1: Formulation of Herbal Hair Dye.

Formulations	Henna (gm)	Indigo (gm)	Amla (gm)	Bhringraj (gm)	Myrobalan (gm)	Tea Deccotion (ml)
F-1	2	3	1	1	1	2
F-2	2	2	1	1	2	2
F-3	3	2	1	1	1	2
F-4	1	2	1	1	4	2
F-5	4	2	1	1	2	2
F-6	2	2	4	1	2	2

Characteriztion of Formulation on Human Hair

The human white hair procured from barber shop of Salem, Tamil Nadu, India, was cutted into small pieces. The human hairs were dipped into a each formulation placed in a china dish for 2 hours. Then they are divided into two categories to observe the affects of room temperature and sunlight.

Primary Irritation Testing[11]

All animal experiments were carried out in accordance with guidelines of CPCSEA and the study was approved by the Institutional Animal Ethical committee (CPCSEA/887/Po/Re/s/2005). Six healthy female wistar albino rats, weighed 200-250gm were selected for study. Each rat was caged individually food and water given during the test period 24hrs prior to the test. The hair from the back of each rat of $1cm^2$ was shaved on the side of the spine to expose sufficiently large test areas, which could accommodate three test sites were cleaned with surgical spirit. 1ml quantity of formulations (F1-F6) was applied over the respective test sites of one side of the spine. The test sites were observed for erythema and edema for 48hrs after application.

Effect of Colored Human Hair on Room Temperature

The colored human hairs were pasted on a white paper sheet covered with transparent cellophane sheet and then kept for 30 days at room temperature. The photographs were taken on 0^{th}, 15^{th} and 30^{th} days.

Effect of Colored Human Hair on Sunlight

The colored human hairs were pasted on a white paper sheet covered with transparent cellophane sheet and then kept in sunlight for 2 hours daily for 30 days. The photographs were taken on 0^{th}, 15^{th} and 30^{th} day

Effect of Colored Human Hair on Shampoo Washing

The colored human hair was washed with mild shampoo on alternative days. The photographs were taken on 15^{th} and 30^{th} day

RESULTS AND DISCUSSION

Table 2: Physical Evaluation (Ash Values).

S.no	Plant name	Total ash	Acid insoluble ash	Water soluble ash
1	HENNA	14.60%w/w	4.50% w/w	3.0% w/w
2	INDIGO	40.0% w/w	15.0% w/w	5.0% w/w
3	AMLA	7.5% w/w	8% w/w	2% w/w
4	BHRINGRAJ	6.1% w/w	8.98% w/w	17.95% w/w
5	MYROBALAN	4.56% w/w	2.75% w/w	2.07% w/w

Table 3: Percentage yield of extract.

S.no	Plant name	Weight Taken of Powdered Drug (gm)	Weight of Extract Obtained (gm)	Percentage Yield (%w/w)
1	HENNA	150	37	24.66
2	INDIGO	150	32	21.3
3	AMLA	100	27	27
4	BHRINGRAJ	100	29	29
5	MYROBALAN	100	30	30

Table.4 Phytochemical Studies.

S.no	`Phyto- Constituents	Henna	Indigo	Amla	bhringraj	myrobalan
1	Alkaloids	-	-	-	-	-
2	Glycosides	-	-	+	-	+
3	Tannins	+	+	+	+	+
4	Anthraquinones	+	+	+	+	+
5	Carbohydrates	+	+	+	+	+
6	Terpenoids	+	+	+	+	+
7	Coumarins	+	+	+	+	+
8	Flavonoids	+	+	+	+	+
9	Saponins	-	-	+	+	-

(+) - Present, (-) - Absent

Primary Skin Irritation Test

Primary skin irritation test was conducted to evaluate the irritation by the prepared

formulations on intact skin of rats. All of the prepared formulations were not showed any erythema and edema; this indicates that the prepared formulations were non-irritant on skin of rats.

Formulation

As presented in Table 1, alcoholic extract of Henna, Indigo, Amla, Bhringraj exhibited moderate to very good coloring property on human white hair.The dark brown color retaining power of the human hair of each formulation retained for 30 days at room temperature (Fig. 1). In sunlight, the color stain of the human hair faded gradually. After fifteen days, the stains of human hair was gradually reduced. It indicated that UV rays present in sun light affected the hair stain/hair dye (Fig.2). Washing of the colored human hair with mild shampoo on alternate days affect the stain of the human hair (Fig. 3& 4).

Six hair colorant formulations F-1, F-2, F-3, F-4, F-5 & F-6, out of which formulations F-2, F-3 & F-5, obtain better coloring effect on human hair when compared to F-1, F-4 & F-6. The dark brown color capacity of the formulation F-5 was maximum due to the higher proportion of henna and synergistic effect of other plant extracts.

The formulations according to coloring capacity, F-1(light brown color), F-2 (medium brown color), F-3(medium brown color), F-4(light brown color), F-5(dark brown color), F-6(light brown color).

The dark brown color remained for the longest duration of period when the human hair kept at room temperature. In sun light and washed with mild shampoo, the order of coloring human hair by herbal formulations was-F- 5 >F-3 >F-2 >F-1 > F-4 > F-6.

The maximum coloring effect produced, when the higher proportion of henna (*Lawsonia inermis linn*) was present. The F-4 contains higher amount of myrobalan (*Terminalia chebula Retz*) exhibit poor coloring effect and F-6 contains higher amount of amla (*Emblica officinalis*) also exhibit poor coloring effect.

DAY 0

DAY 15

DAY 30

Fig.1 Effects of formulation on room temperature photographs take on 0th, 15th and 30th day.

DAY 0

DAY 15

DAY 30

Fig.2: Effects of formulation on sunlight photographs take on 0^{th}, 15^{th} and 30^{th} day.

DAY 15

DAY 30

Fig.3 Effects of formulation on room temperature after shampoo wash. Photographs taken on 15th, 30th day.

DAY 15

DAY 30

Fig. 4: Effects of formulation on sunlight after shampoo wash.Photographs taken on 15th, 30th day.

CONCLUSION

From present study it has been concluded that the maximum colorant action of F-5 (high amount of henna compared to others) was due to synergistic effect of each plants extract. The hair coloring activity of alcoholic extract was better due to its high affinity towards solubilization of plant derived chemicals.

The developed powder herbal hair dye is promising natural hair colorant and recommended

for use as medium brown to dark brown. Ayurvedic polyherbal powder hair dye of present investigation is semi-permanent in nature and exhibit better dyeing efficiency than marketed herbal hair dye. The developed ayurvedic hair dye formulation is prepared from purely natural substances, free from chemicals, so considered to be non-irritating, nontoxic and devoid of any side effects such as hair fall, dandruff production etc.

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