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Research Article

# Formulation and Evaluation of Herbal Hair Dye

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## ABSTRACT

The present study focuses on the formulation and evaluation of a 100% herbal hair dye using natural plant-based ingredients as an alternative to synthetic chemical dyes. Herbal dyes offer advantages such as safety, non-toxicity, scalp nourishment, and environmentally friendly properties compared to conventional dyes, which often cause irritation and hair damage. In this formulation, key herbal constituents including Lawsonia inermis (Henna), Indigofera tinctoria (Indigo), Aloe vera, Amla, Hibiscus, Beetroot, Coffee, and Black Catechu were selected for their dyeing and hair-conditioning properties. Various formulations (F1–F4) were prepared by adjusting the ratios of henna and indigo to achieve shades ranging from soft black to light brown. The prepared dyes were subjected to phytochemical, organoleptic, microscopic, and stability evaluations. Results indicated the presence of beneficial phytoconstituents such as flavonoids, tannins, glycosides, and terpenoids that contribute to dyeing efficacy and scalp health. The formulations demonstrated good stability, effective coloration, and no adverse effects on hair or scalp. The study concludes that the developed herbal hair dye is safe, effective, eco-friendly, and suitable for all age groups, with potential to serve as a natural substitute for synthetic hair colouring products

## INTRODUCTION

### Natural Hair Dye Benefits.

Natural hair is a hair colouring product that is made from natural ingredients, such as herbs, fruits, and vegetables, instead of synthetic chemicals. this type of hair dye has gained popularity in recent years as people become more conscious about the potential health risk associated with synthetic hair dyes.

One of the benefits of using natural hair dye is that it is gentler on the hair and scalp synthetic hair dyes often contain harsh chemicals like ammonia and peroxide, which can cause irritation and damage to the hair and scalp. Natural hair dye, on the other hand, typically uses ingredients like

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henna, indigo, amla and beet juice, which are gentler and less likely to cause adverse reactions.

Another advantage of natural hair dye is that it can provided a more subtle and natural-looking colour. Synthetic hair dyes can often look overly bright or artificial, especially if the colour is not well-matched to the individuals skin tone or natural hair colour.

Natural hair dyes tend to create more nuanced shades that blend better with the individual's natural hair colour.

Mostly preferred the natural hair dye as compare to chemical hair dye because chemical hair dye cause skin related disease that's why natural herbal dyes are being preferred nowadays.

Herbal drugs without any adverse effect are used for healthy hair. The dyeing of hair is an ancient art that involves treatment of the hair with various chemical compound the need of herbal based natural medicine is increasing Fastly due to natural goodness and lack of side effect. almost 70% of the population face the problem of blading and greying of hair.

The most widely used ayurvedic herbal drugs amla, henna, traditionally used as hair colorant and for hair growth. indigo, known as an initial fabric dye, indigo mixed with henna to make different light brown to black shades of hair dye.

A dye can generally be described as a coloured substance that has an affinity to the hair. The dye is generally applied as aqueous solution, and may require mordant to improve the fastness of the dye on the hair. natural dyes also referred as mordant dyes. Different mordant will give different hue colour with same dye. The mordant which is allows the reaction between the dye and hair.

## MATERIALS AND METHOD

### 2.1 plant source:

The following plant materials were collected from the garden and authenticated by the botanist the materials were dried in shade and powdered.

### 1) Henna

The botanical name of Henna is Lawsonia inermis which is the only species of the genus Lawsonia and belongs to the family Lythraceae. The leaves of this plant possess a red dye molecule called lawsone (2-Hydroxy-lyl-naphthaquinone), which has the ability to bond with the protein. The other components like Lawsone 1, 4-naphtha quinone: 2-methoxy-3-methyl-1,4-naphthaquinone
flavonoids, coumarins, phenolic acids: 5-10% gallic acid and tannins. Henna balances the pH of the scalp preventing premature hair fall and greying of hair [2]

### 2) Black Catechu

The botanical name of Black Catechu is Acacia catechu / Acacia chundra. It belongs to Family Leguminosae. It is used as colouring and dyeing agent.

### 3) Aloe Vera

The botanical name of Aloe Vera is Gawar Patha, It belongs to Liliaceae family. Aloe Vera is effective for scalp and can be used not only to treat hair loss, but to promote hair growth as well. Aloe Vera contains aloe emodin which promotes hair growth hy stimulating hair follicles. It is also useful in treating the scalp from sun burn. It is used as a natural mordant. It is also known for its emollient effect

### 4) Indigo

The botanical name of Indigo is Indigofera Tinctoria and Family Name Fabaceae the indigo

Leaves are used to make hair dye as well as prepare medicated hair oil. leaf powder is used as a natural black colour dye for hair. Indigofera makes your hair more manageable, moisturized, protected with radiant shine The root is crushed and prepared into the decoction, and given for abdominal disorders, leucorrhoea, all types of toxicities etc. The leaves are crushed, prepared into a decoction, and given for toxicities, fever, arthritis etc. the leaf juice is given in the dose of 10-20ml along with honey twice daily for jaundice, inflammation of liver etc.

**Table1: Formulation Composition**

| Sr no | Ingredients | F1 | F2 | F3 | F4 |
|---|---|---|---|---|---|
| 1 | Henna | 2.5gm | 4gm | 6gm | 7.5gm |
| 2 | Indigo | 7.5gm | 6gm | 4gm | 2.5gm |
| 3 | Aloe vera | 2gm | 2gm | 2gm | 2gm |
| 4 | Amla | 2gm | 2gm | 2gm | 2gm |
| 5 | Beet root | 2gm | 2gm | 2gm | 2gm |
| 6 | Hibiscus | 2gm | 2gm | 2gm | 2gm |
| 7 | Coffee | 2gm | 2gm | 2gm | 2gm |
| 8 | Black catechu | 2gm | 2gm | 2gm | 2gm |

**Fig 1: Formulation Of Herbal Hair Dye**

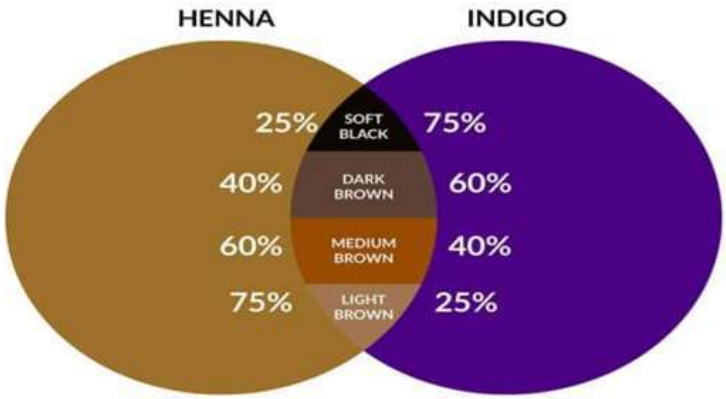



**Fig 2: combination of Henna and Indigo**

- We have Chosen the combination of a Henna And indigo so that it produces the desirable color
- It is 100% Herbal dye
- As the other herbal dye includes the preservative and some chemical agent but we not use all these chemicals It gives desirable output after applying on hair without any side effect

## RESULTS AND DISCUSSION

**Table 2: Practical Yield of Herbal Extracts**

| Name of extracts | Practical Yield |
|---|---|
| Henna | 4.522gm (45.22%) |
| Black Catechu | 2.878 gm (5.75%) |
| Aloe vera | 35.152 gm (70.30%) |
| Indigo | 16 gm. (80%) |
| Amla | 1.347gm (2.5%) |
| Beet root | 3.425gm (5.65%) |

| | |
|---|---|
| Hibiscus | 25.34gm (60.43%) |
| Coffee | 13.65gm (47.32%) |

**Phytochemical Study of Plant Extract**

**Table 3: Morphological Studies:**

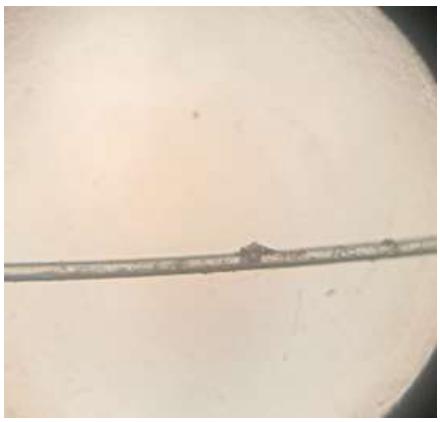
| Extract | Colour | Odour | Taste |
|---|---|---|---|
| Henna | Reddish Brown | Characteristic | Bitter and Astringent |
| Black Catechu | Light brown to black | Odorless | Astringent |
| Aloe vera | Greenish brown | Characteristic | Bitter |
| Indigo | deep blue-purple | pungent | does not have a taste |
| Amla | light greenish-yellow | strong musky odor | sour and slightly bitter |
| Beet root | dark pinkish-red | distinct earthy odor | sweetness |
| Hibiscus | red | modest fragrance | sweet and sour |
| Coffee | soft greys | lightly caramelized and almost nutty | balance of bitterness, acidity, and sweetness |

## Phytochemical Screening

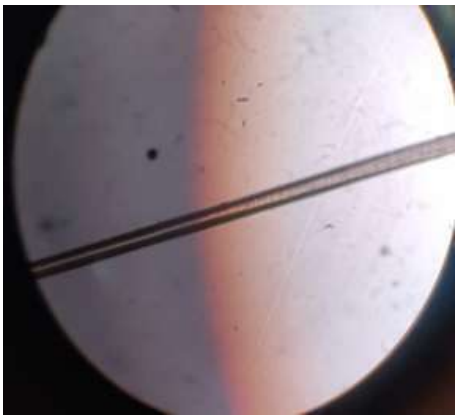
**Table-4: Phytochemical Screening**

| Sr no | Phyto-constitutes | Henna | Indigo | Aloe vera | Amla | Beet Root | Hibiscus | Black catechu | coffee |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Alkaloid | - | - | - | + | + | + | - | + |
| 2 | Glycosides | - | - | + | + | + | + | - | + |
| 3 | Flavonoid | + | + | + | + | + | + | - | + |
| 4 | Saponin | - | - | + | + | + | - | - | + |
| 5 | Carbohydrate | + | + | + | + | + | + | + | - |
| 6 | Terpenoid | + | + | - | + | - | - | + | + |
| 7 | Coumarins | + | + | + | + | - | - | + | + |
| 8 | Tannins | + | + | + | + | + | + | + | + |
| 9 | Anthraquinones | + | + | + | + | - | + | - | + |

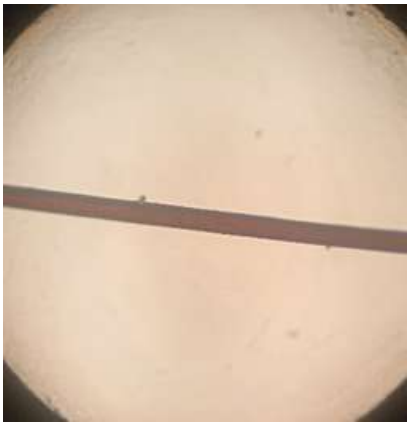
## Microscopic evaluation



**Before applying hair dye on white hair dye on white hair**



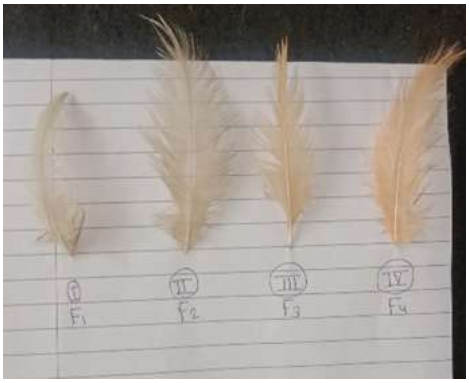
**After applying hair dye and observe in 1 hour and observe in 1 hour**



**After applying hair dye and observe in 2 hour under microscope**

**Effect of hair dye on feather**

**Apply hair dye on feather**



**Day 1st**

**Day 2nd**

**Effect of hair dye on feather with lemon juice**

**1ST Day**

**2nd Day**

**3rd Day**

- The lemon juice (Citric Acid) acts as a natural bleaching or oxidizing agent and when exposed to sun, it speeds up the bleaching process.
- The hair lightening effect is more evident in blonde and light brown hair.
- When you expose your hair to sunlight after applying lemon juice, the citric acid opens your hair cuticles. This strips away the first layer of hair color, resulting in a natural change in color

**Stability Test-**

**Table 5: Stability Test**

| Sr no | Parameter | Room Temperature | 35° C |
|---|---|---|---|
| 1 | Colour | No change | No change |
| 2 | Odour | No change | No change |
| 3 | Texture | fine | Fine |
| 4 | Smoothness | Smooth | smooth |

## CONCLUSION

- It Can be wind up from the consideration that by convert the proportion of Henna and Indigo suitable light black, dark brown, medium brown, light Brown to obtain a hair.
- A PH is 6.67 is best for the penetration of hair colorant.
- We also added the aloe vera, amala, beet root, coffee to show the hair dye activity.
- We are also added the lemon juice as a different batch to see the effect, but we observe the herbal dye intensity increases with the lemon juice.
- The herbal base hair dye has been prepared.
- A hair dye colours the hair pack in combination almost gentle manner.

The most important advantage of herbal predicated cosmetic is nontoxic nature, no cause any irritation. it helps to treat dandruff by moving excess oil from scalp. Contamination, severe climate stress poorly affects the quality of their herbs. In this research we found effective properties of the herbal hair dye and further studied are needed to the performed to explore more useful benefits of this herbal hair pack .it is prepared form 100% water soluble ingredient. Basic material used in final product is totally environmentally -safe. Product stable at room temperature. The 100% pure herbal hair dye is suitable for all age group. the mode of preparation and composition is environmentally safe

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