

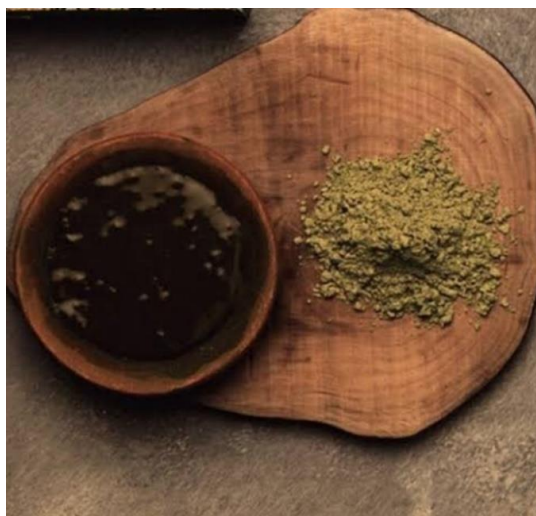
Review on: Formulation and Evaluation of Herbomineral Hair Dye

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ABSTRACT:

The present investigation, attempts were made to make a powder herbal hair dye that gives dark brown to black colour to hair, resembling natural Hair colour with better dyeing effect and greater retention capacity on comparison with marketed herbal hair dye formulation. Most of the marketed Herbal hair dye formulations contain para- phenylenediamine at 20-25% concentrations which is the main ingredient of commercial synthetic dyes. It is known to trigger allergic skin reactions in many people. Ayurvedic powder hair dye devoid of any synthetic agent was prepared in present research Work and evaluated for dyeing efficiency. Different combinations of powdered leaves, fruits of plants like Madayantika, Bhringraj, Amla and Nilini Were evaluated as hair dyes. Ayurvedic polyhedral powder hair dye of present investigation is semi-permanent in nature and exhibit better dyeing efficiency than marketed herbal Hair dye.

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I. INTRODUCTION:

The beauty of skin and hair basically depends on Individual's health, diet, habits, job routine, climatic Conditions and maintenance. Synthetic hair dyes which are available in the market, uses combination of peroxide and Ammonia which alters the structure of hair and damage it and also causes allergic reactions. Para-phenylenediamine (PPD), a key ingredient of many synthetic hair dyes is known to trigger allergic skin rashes in many people. It also causes dermatitis around lips, reddening and swelling of scalp and face etc. Vegetable dyes e.g., Madayantika leaves, Bhringraj etc. are semi-permanent dyes, used traditionally and believed to be safe and nontoxic. Plants have been used traditionally for their hair coloring, growth promoting and anti-aging properties. It has been found in the local market survey that the most of the marketed herbal formulations in India, though claim to be natural, safe and effective may actually contain the harmful synthetic agent, para-phenylenediamine (PPD), at 20-25% concentrations which is the main ingredient of commercial synthetic dyes. As global scenario is now changing towards the use of Safer, nontoxic natural product with traditional use, Attempts have been made in the present investigation to Develop herbal hair dye devoid of any chemical, containing few traditionally used herbs and modifiers; and compare it with marketed purely herbal hair dye.

Herbo-mineral formulation containing different proportions of few herbs and loha / mandur bhasma was prepared to get dark brown to black colour to hair as it is most favorite colour of Asian population.



Hair Dye:

- It is chemical tool used to change the colour of persons hair.
- Mostly to change the gray hair or white hair. •Now a days younger people as fashion.

➤Types of hair dye:

a. Permanent Hair Dye:

- Most Popular hair dye product.
- Peroxide and ammonia are present in excess.
- Oxidation Occurs. –They cause hair damage.

b. Semi-permanent Hair Die:

- Natural affinity for the hair.
- It contains nitro-phenylene diamine either nitro-amino phene –Low level of peroxide or ammonia.
- Less damaging.

c. Temporary Hair Dye:

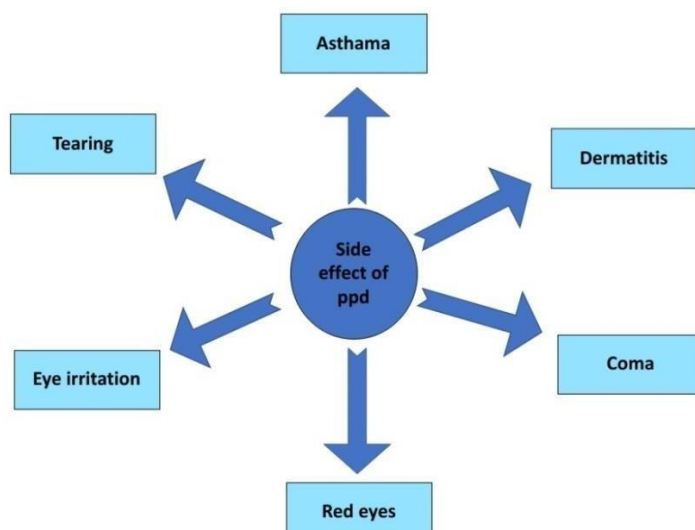
- Cannot penetrate the cuticle layer.
- Does not change structure of hair.
- There is flammable.
- List Hazardous.



Side Effects of Synthetic Hair Dye:



❖Side Effect of Paraphenylene Diamine:



➤Advantages:

- 1) Colour your hair with no chemical and more natural ingredients.
- 2) Natural Hair Colour covers the gray hair with no side effects.
- 3) Deeply conditions and nourishes hair strands from the core.
- 4) Cure the existing hair problems.
- 5) Suitable for all hair types.
- 6) Minimal environmental impact.
- 7) Available in a variety of colour shades.

➤Limitations:

- 1) More expensive.
- 2) Natural hair may also be harmful to some extent.
- 3) Another issue with natural dyes is their availability. It can be difficult to produce because the availability of raw materials.

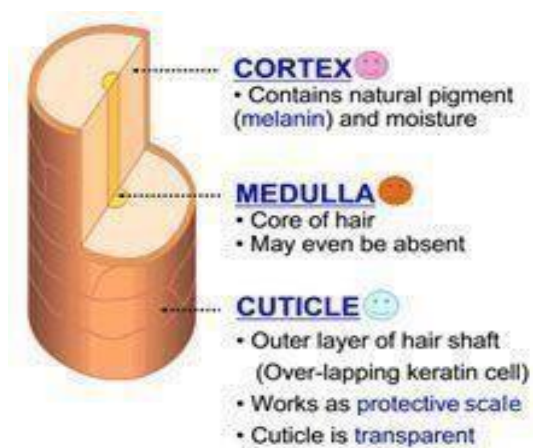
➤Ideal hair dye:

- 1) It should not be toxic to skin or hair and should not impair the natural gloss and texture of hair.
- 2) It should not be dermatitis sensitizer.
- 3) The colour that imparts to hair must be stable to air, light, water and shampoo.
- 4) Should be easy to apply.

† **Herbomineral Hair Dye:** it is the combination of the plant-based ingredients and the mineral which is tool to change the colour of person's hair.

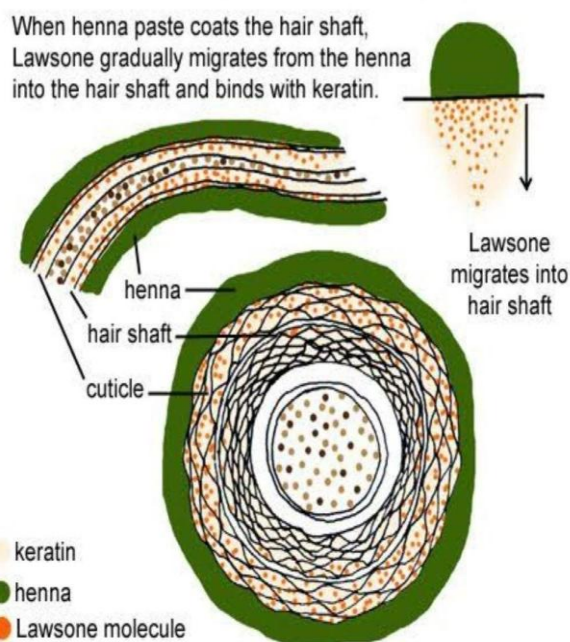
† **Hair Basics:**

- Hair is made up of protein and water. The water/moisture content is responsible for suppleness of your hair.
- Hair is dead and damage cannot be permanently repaired. You can maintain and preserve your hair but once it is damaged, it cannot be repaired.
- Hair growth begins inside the hair follicles.
- Hair fibres have a structure consisting of several layers, starting from the outside:
 1. The cuticle, which consists of several layers of flat, thin cells laid out overlapping one another as roof shingles.
 2. The cortex, which contains the keratin bundles in cell structures that remain roughly rod-like.
 3. The medulla, a disorganized and open area at the fiber's center.
- Melanin is what gives colour to skin, eyes and hairs. It's the ratio of two types of melanin eumelanin and pheomelanin that determines the colour of the hair.



† **Mechanism of Hair Dye:**

Schematic Diagram of Henna Dying Hair



† **Role of the Ingredients:**

• **Henna (Madayantika) :**

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-1,4-naphthoquinone). The Henna balances the pH of the scalp preventing premature hair fall and graying of hair. Henna is used as a dye either alone or in combination.

Chemical Constituent: Lawsone, Esculentin, Fraxetin, Isoplumbagin, Scopoletin, Betulin, Betulinic acid, Hennadiol, Lupeol, Lacoumarin, Laxanthone i, ii and iii, Flavone glycosides, Two pentacyclic triterpenes.

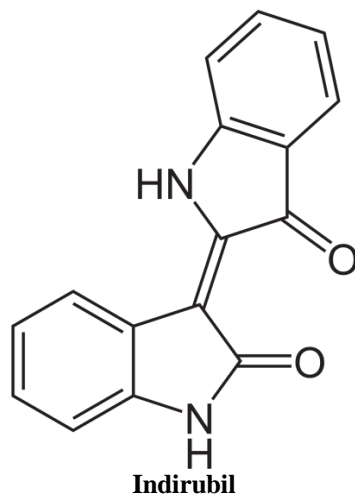


• **Nilika:**

The botanical name of nilika is *Indigofera tinctoria* which is also called as true indigo. It imparts the blue dye. It acts as a great conditioner. It promotes hair growth and prevent itching on scalp and reduces dandruff.

Chemical Constituent: Indigo dye contains flavonoids, terpenoids, alkaloids, glycosides, indigotine, indirubin, rotenoids. From a complex method of extraction and purification, Indirubin, a pink colored pigment by-product of indigo.

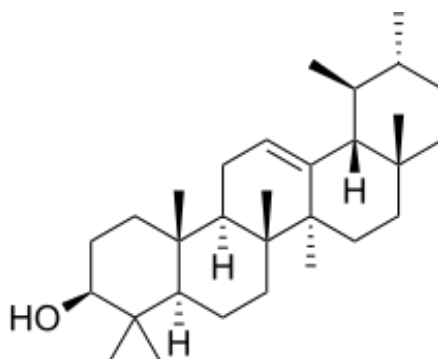




Bhringraj:

The botanical name of Bhringraj is *eclipta prostrata*. Family is Asteraceae. Which prevent hair fall and premature graying. It stimulates hair growth.

Chemical Constituent: The plant contains the alkaloid ecliptine. Other chemicals identified are wedelolactone, wedelic acid, apigenin, luteolin, b-amyrin etc.



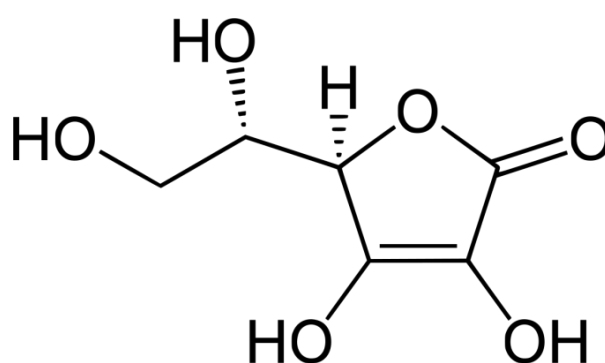
Ecliptine

Amla (Indian Gooseberry):

its botanical name is dried powder of *embilica officinalis*. Family is *euphorbiaceae*. It is used to promote hair growth. The herb is also used in shampoo, hair oil and hair dyes.

Chemical Constituents:

These fruits are reputed to contain high amounts of ascorbic acid (vitamin C), and have a bitter taste that may derive from a high density of ellagitannins, such as emblicanin A (37%), emblicanin B (33%), punigluconin (12%), and pedunculagin (14%). Amla also contains punicafolin and phyllanemblin A, phyllanemblin other polyphenol, such as flavonoids, kaempferol, ellagic acid, and gallic acid.



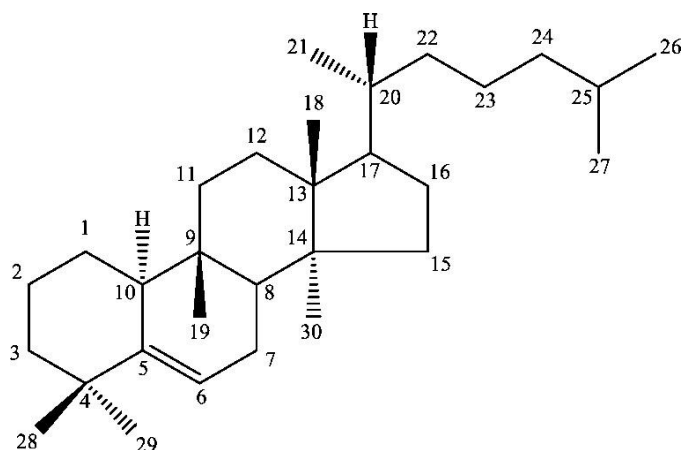
Ascorbic Acid

Cucurbita Pepo :

It is also called as summer squash. Its family is Cucurbitaceae. It consists of colouring characteristics.

Chemical Constituent: It contains several phyto-constituents belonging to the categories of alkaloids, flavonoids, and palmitic, oleic and linoleic acids



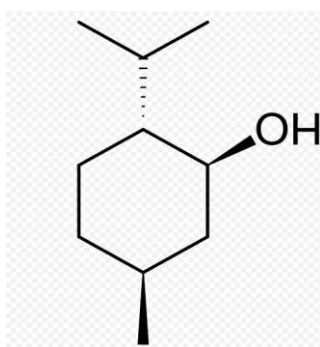


Cucurbita

Peppermint (Mentha):

The botanical name is *mentha piperita*. family is labitae its fragrance is pleasant and it may help with dryness, itching or scalp problem. It also boosts hair growth.

Chemical Constituent: The mint main chemical compounds consist of limonene, cineole, menthone, menthofuran, isomenthone, menthyl acetate, isopulegol, menthol, pulegone and carvone



Menthol

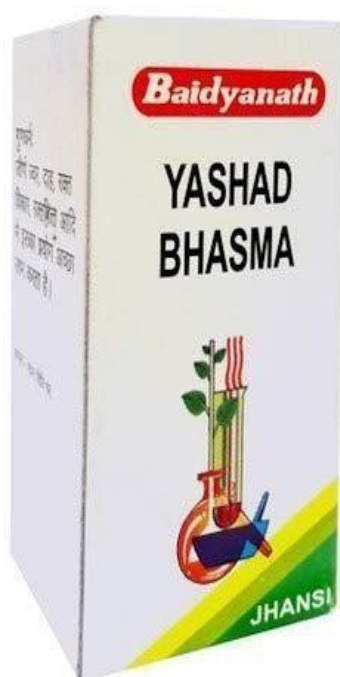
Mandur Bhasma (Loha Bhasma):

It is the medicine prepared from iron used for anemia, eye disorder, skin disease etc. It imparts the dyeing effect also gives strength to the hair. It is natural colorant in nature and a coolant in nature. It improves strength, immunity, skin texture. Mother Earth is made up of different types of metals and minerals, and though we may not realize there are many therapeutic efficacies of these buried metals. The iron that remains preserved under the earth's crust for 80 – 100 years, starts rusting and is chemically known as Ferric Oxide. This iron is extremely beneficial and when purified and crushed forms the ayurvedic formulation Mandoor Bhasma.



•Yashad Bhasma (Zinc Bhasma):

Unique Bhasma is prepared using the Ayurvedic process of Shodhan or purification and Maranaor burning. After the transformation of the base metal into Bhasma, the resulting ash undergoes several tests -known as Bhasma Pariksha in Ayurveda, to check their purity and efficacy. After its elaborate processing, Yashad Bhasma comes into existence as a natural and safe sunscreen option to use.



II. MATERIALS AND METHODS:

Leaves of Madayantika (*Lawsonia inermis*) and Nilika (*Indigofera tinctoria*), Amla dried fruits (*Phyllanthus emblica*), whole herb of Bhringraj (*Eclipta Alba*) were procured, powdered and passed through the Sieve number 80. Loha bhasma is mixed with it.

STEP: I

Collection of plant materials from medicinal plant garden (CBCP) and authenticated

STEP: II

Evaluation of purity and quality of raw materials by morphological, physical and chemical techniques, toxicological studies were performed

STEP: III

All the drugs were made into powder weighed according to the formula mentioned

STEP: IV

Prepared herbal hair dye formulas

STEP: V

Human white hairs were collected from human voluntaries

STEP: VI

The formulated dye pastes were kept a side for 1h for imbibition and then the white hair samples were kept in the above paste for 30 min, 1 hr, and 2 hrs then washed with water and observed for its dyeing effect (colour grade), safety parameters, for all formulations.

★ **Selection of Suitable Combination with Henna:**

One gram of henna was mixed with same proportion of indigo, tea, amla, bhringraj and 20% urea and water were added to that in order to make a smooth paste. The paste was kept aside for 1 h for imbibition. The hair was kept in above paste for 1 hour. After that it was washed with water and observed for its colouring.

★ **Selection of Suitable Combination of Henna and Indigo:**

Henna was mixed with indigo in different ratios from 1:1 to 1:5, mixed with water to make smooth paste and processed similarly as above to observe colouring.

★ **Effect of Successive Application of Selected Combination of Henna and Indigo:**

1: 3 Ratios of henna and indigo were selected and to that successive application of paste was studied. The henna and indigo paste was applied 2 to 4 times and washed repeatedly with shampoo and observed for its colouring.

★ **Effect of Modifying Agents Over Hair Colorants:**

One gram of henna and three grams of indigo powders were weighed and taken in a dish; 20% of urea and 1% of ferric chloride were added and made into paste. The paste was kept for 1 hour. Similarly, preparations containing 3 and 6% of ferric chloride were also prepared. The above pastes were applied to the white hair, waited for 1 hour. The hair colour was observed under microscope after washing with water. Similarly, same concentrations of copper sulphate were also prepared and observed.

Formulation:

Different grades (1-12) were assigned to colours ranging from jet black to blonde using an experimental colour grade scale. White hair was used as a control for the in vitro study. Various dye formulations viz E, F, G, L, M and N were prepared using different ratios of Mehendi: nilika: Amla: Loha bhasma. The herbal powders were weighed accurately, mixed geometrically followed by mixing in a polybag (for 100 g). Herbomineral hair dye X was prepared based on Findings from compositions E, F, G, L, M, N in a large Batch size (500 gm) to get better colour. The formulation X was standardized for physicochemical parameters and compared with marketed herbal hair dye M1 for dyeing efficiency and retention capacity. The photomicrographs of same hair strand samples were Taken using compound electron microscope under 10X Magnification, using 4x optical zoom system of camera, and penetration efficiency of both the dyes was observed in the medulla and cortex region of hair strands.

Product code	Ratio of Mehendi: Nili: Amla : Loha	Colour grade (Day1)	Colour grade after number of shampoo washes							
			2	4	6	8	10	12	14	16
E	4 : 4 : 0.5 : 0.5	2- Off black	2	2	3	4	5	5	5	6
F	5 : 3 : 0 : 2	4- Burgundy	4	4	5	6	6	6	7	7
G	4 : 4 : 0 : 2	3-Darkest brown	3	3	4	4	5	5	6	6
L	4 : 6 : 0 : 0	1- Jet black	1	1	2	3	4	4	5	6
M	6 : 4 : 0 : 0	4- Burgundy	4	5	7	8	8	8	8	8
N	5 : 5 : 0 : 0	2- Off black	2	3	3	4	4	4	5	5
Mkt d	5 : 0 : 1 : 0.5	9- Fox red	9	9	10	11	11	12	12	12

Table No1. Colour retention capacity of herbomineral hair dye and marketed herbal hair dye.

- Colour grade: Hair colour was graded as 1 to 12 by comparing with experimental colour grade scale. The observations were reported after 2, 4, 6, 8, 10, 12, 14 and 16 shampoo washes.
- Retention capacity / Colour lasting capacity: Retention capacity of herbal hair dye can be defined as ability of hair dye to retain or last particular hair colour on white /blonde human hair for definite period of time. In present investigation, the hair was washed with mild shampoo on alternate days using tap water till 16 shampoo washes (32 days) and retention capacity was determined in terms of number of shampoo washes that a colour can withstand.

Product code	Ratio of Mehendi: Nili: Amla : Loha	Colour grade (Day1)	Colour grade after number of shampoo washes (in vitro study)								Retention property (No. of shampoos)
			2	4	6	8	10	12	14	16	
X	4:4.5:0.5:0.5	2 – Off black	2	2	3	3	4	5	6	6	10-12
Mkt d M ₁	5:0:1:0.5	9-Fox red	9	9	10	11	11	12	12	12	6-8

Table No2. : Comparison of colour retention capacity of herbomineral and mkt herbal dye

