

Formulation and Evaluation of Polyherbal Hair Dye

Ms. Sachi Kshirsagar Naik¹, Ms. Utkarsha Ram Karnewar², Ms. Purva Sanjay Tirbhane³

Prof. Diksha Bais⁴, Dr. Manisha D. Kitukale⁵

Bachelor's Students, Department of Pharmaceutics^{12,3}

Assistant Professor, Department of Pharmaceutics⁴

Principal, P. Wadhwani College of Pharmacy, Yavatmal, India⁵

P. Wadhwani College of Pharmacy, Yavatmal, India

Abstract: Hair dye or hair colorings is the process for changing the hair color which is the made up from natural herbs flower and plants. These ingredients use in herbal hair dye is used to give natural glossy hair and promotes longer and thicker hair, grey or white hair can be covered with various hair dyes and it can also be used to adapt ones preferred hair colour or restoreddiscolored or bleached hair color it gives texture to the natural hair. graying of hair is assign to reason like genetics, stress, smoking, nutritional deficiency. Generally, it grows in three cyclic phases that is anagen (growth), catagen (involution) and telogen (rest) the anagen phase can be as short as 2-6 years.

Keywords: Hair dye or hair colorings

I. INTRODUCTION

Hair dye or hair colorings is the process for changing the hair color which is the made up from natural herbs flower and plants. These ingredients use in herbal hair dye is used to give natural glossy hair and promotes longer and thicker hair, grey or white hair can be covered with various hair dyes and it can also be used to adapt ones preferred hair colour or restoreddiscolored or bleached hair color it gives texture to the natural hair. graying of hair is assign to reason like genetics, stress, smoking, nutritional deficiency. Generally, it grows in three cyclic phases that is anagen (growth), catagen (involution) and telogen (rest) the anagen phase can be as short as 2-6 years. In cataphase, the growth activity increases and hair moves to the mixed phases, cataphase is between 2-3 weeks .in telogen hair moves into resting state. This phase last for 2- 3 months.

Adverse effect of hair dyes or hair colorings require the use of chemical which are capable for removing or covering up the dyestuff or tint naturally it is found inside the hair fiber. Use of this chemical can result into wide range of adverse effect it including scalp irritation, hair loss, photosensitivity, alopecia (Hair loss) Etc. Systemic effects also be seen while the use of hair dyes that is anaphylaxis (Hypersensitivity reaction), asthma, cardiovascular problems, liver inflammation can occur. Mostly In women commonly is seen this hair breakage problems that is arises due to interaction with- blood thinners, diabetes mellitus, enhanced sensitivity to sunlight, and interaction with other hair products.

You are particularly at a risk if you have harmful chemical-based hair dyes that it contains high level of PPD (paraphenylenediamine) it is a chemical base for hair colour which is metallic salts for color these salts are a combination with of copper, lead, silver, and other metals with a weak acid at 20 to 25% it is a key aspect in most of the hair dyes if exposure is too high then it can cause some serious health problems. A patch test is suggested before using permanent or semi-permanent hair dye. It involves that applying a small amount of dye using cotton swab behind the ear and letting it dry. In India henna has been used traditionally for colorings hands and hairs nearly 70 % of human beings that above 40 years struggling with the problem of graying of hair.

Overcome to this problems, herbal hair dyes are generally considered as a less grating on hair than chemical-based dyes and can have some several benefits it includes - herbal hair dyes there is no side effect while compared to chemical-based hair dyes. Many of these ingredients are riched with vitamin and minerals it provides nourishment to the hair, it quickly fixes hair color without any side effects, it is chemical free from ammonia and peroxide and

polyphenylene diamine. The herbal ingredients came to a known as nontoxic and it does not contain chemical, preservatives, artificial colours or perfumes.

It prevents hair fall and breakage also it improved scalp health maintain ph. level; it provides perfect environment for the growth of thicker hair. The favor of natural based herbal hair dye increasing Fastly due to their goodness of natural ingredients and lack of side effects. Henna, indigo, amla, curry leaves, tea leaves, hibiscus, aloevera, butea monospermic (Flame of the forest).¹

Types of hair dye

Temporary

- These hair colour are used to color hair temporary
- After shampooing easy to rinse off water
- Finely crushed metals and puffer spray is used for temporary hair color
- Setting lotion and powder are used for temporary color

Use a crystal violet and leuco derivative of a basic dye to create temporary hair colour³

Semi – permanent

- In semipermanent hair dye most commonly, used base is shampoo
- To improve colorant performance, we add a solvent
- If have natural affinity for hair due to their cationic properties
- It contains nitro phenylene diamines, nitroaminophenes or both aminoanthraquinones³

Permanent

- The intermediates react chemically with modifiers in a coupling reaction of slow oxidation process.
- On mixed race and white hair permanent hair dye is extremely successful.
- It may cause hair damage.³

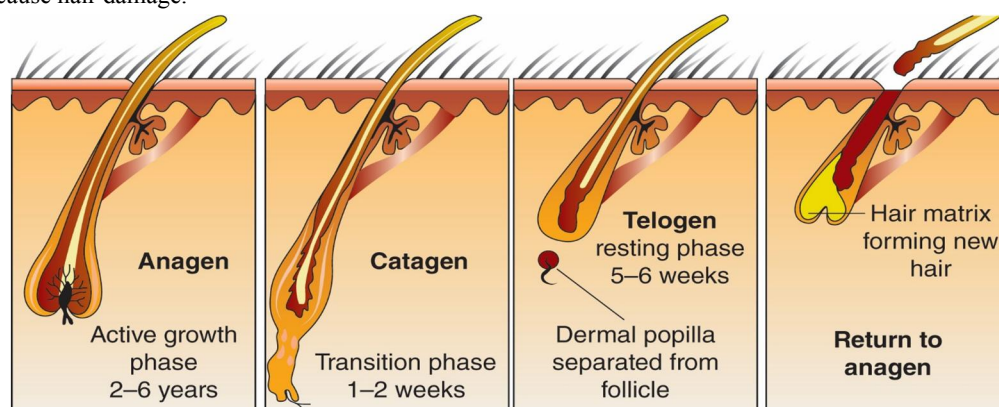


Fig 1: Hair Growth Cycle³

Anagen Phase

The anagen phase, often referred to as the 'Growth Phase' or 'Active Phase,' is fixed by rapid cell division at the hair root, leading to the production of new hair. During this phase, hair grows about half an inch per month (around 6 inches per year) and grows faster in summer than in winter. Anagen follicles are long and straight, with hair lying flat against the body. The proliferating matrix cells have a cell cycle of about 18 hours, with daughter cells moving through six lineages: the inner root sheath (IRS) and hair shaft (HS). The IRS layers include Henley, Huxley, and the cuticle, while the HS layers consist of the cuticle, cortex, and medulla. As HS cells mature, they expel organelles and form bundles of

10-nm filaments composed of cysteine-rich keratins, which cross-link to provide the hair shaft with remarkable tensile strength and flexibility.³

Catagen Phase

When the growth phase ends, the catagen phase begins. At this stage, melanocytes stop producing pigment, and the formation of hair shafts is inhibited, resulting in a significant decline in the differentiation and proliferation of hair matrix keratinocytes. Apoptosis causes the hair follicle to shrink to about one-sixth of its original size. A unique structure called clubbed hair forms during this stage. The club hair is anchored in the telogen follicle by a keratinized, brush-like structure at its base, surrounded by outer root sheath (ORS) epithelial cells. The dermal papilla transforms into a cluster of dormant cells located next to the regressing hair follicle epithelium, moving from the subcutis to the interface between the dermis and subcutis to maintain contact with the hair follicle epithelium, including the bulge and secondary hair germ. This phase lasts for a few weeks.³

Telogen Phase

In the telogen phase, the club hair is secured by the keratinized brush-like structure at the base of the follicle, surrounded by ORS epithelial cells. The dermal papilla evolves into a cluster of dormant cells adjacent to the regressing hair follicle epithelium, migrating from the subcutis to the dermis-subcutis boundary to stay connected with more distant parts of the hair follicle, including the bulge and secondary hair germ. This stage typically lasts a couple of weeks.³

Exogen Phase

During this period, which can last from 2 to 5 months, new hairs begin to grow in the follicles while older hairs are fixed. Also known as the shedding phase, the exogen phase is an extension of the telogen phase.³

II. LITERATURE REVIEW

1. Gupta P, Tiwari al., (2023)

To evaluate the herbal hair reasons such as lot of aspect effect along with pores and skin inflammation, erythema, loss or damage of hair and skin most cancers. In oxidation device, there's a severe diffusion of the molecule into the cortex, what promotes an extended shade resistance. Herbal preparations viz., herbal pills, herbal tonics, herbal paste, natural shampoo, natural contraceptives and herbal dyes has become popular most of the customer herbal drug treatments represent the quickest developing section to heal the various illnesses.

2. Harrison S, al., (2022)

A child to old all humans desire to look beautiful is human weakness and is as old as the origin of human being itself. In current all the human beings are very careful about their beauty. And to look beautiful humans take care of all parts of body and also various products are available in market to make body attractive Hair colouring, permanent styling and hair structures. J cosmet Dermatol

3. Dureja al, (2022)

Cosmeceuticals are topical cosmetic-pharmaceutical hybrids intended to enhance the beauty through ingredients that provide additional health-related function or benefit cosmeceuticals, serving as a bridge between personal care products and pharmaceuticals, have been developed specifically for their medicinal and cosmetic benefits.

4. Y Madhusudan Rao al., (2024)

Hair dye has evolved significantly over the years, becoming an integral part of fashion and self-expression. This extensive transformation is a testament to the dynamic intersection of science, culture, and personal identity. A natural dye derived from the leaves of the Lawsonia inermis plant, was used to create various shades of red and brown. This practice not only had aesthetic value but also held cultural and religious significance. As civilizations progressed, so did the methods of altering hair colour.

5. Naser Zaid al., (2023)

herbal hair color is used in various disorders such as dandruff, premature greying and head lice etc. In comparison to synthetic hair dyes, natural hair dyes are reported to cause skin and other skin related diseases. The manufacturing process is dangerous to health of the people involved in the process and its applications leads to environmental pollution. Causes potential side effects to the consumers of the product. The side effects from the synthetic dyes have limited use by health-conscious customers throughout the world and has to overcome various regulatory barriers before it reaches its destination. A dye can generally described as colored substance that has an affinity to the fiber hair.

6. Kumar al., (2021)

In the present study, we prepared a powdered herbal hair dye that gives colour to hair, with better dyeing effect and greater retention capacity on comparison with marketed herbal hair dye formulation. Most of the marketed synthetic hair dye formulations contain paraphenylenediamine 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 work and evaluated for dyeing efficiency.

7. Rangari.D. Vinod al., (2024)

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. Natural colorants and dye in: Pharmacognosy and Phytochemistry, (1st Ed, Vol 1). Career publication, India, 2004, pp 98-117.

8. Singh al., (2023);

greying of hair is attributed to reasons like genetics, stress, nutritional deficiency and disease. The primary reason of premature greying is hereditary and it is reported that by the age of fifty, half of the world's population will have fifty percent gray hair. Hence there is a huge demand for hair dyes in the market. Natural dyes are the colors derived from plant, animal or insect matter without any chemical processing.

9. Rashmi Mallya al., (2019);

In the past natural organic substances were mixed with metals such as copper and iron, to produce more lasting or richer shades. Many plants like Lawsonia inermis, Acacia arabica, Eclipta alba, Juglans regia, Pterocarpus indicus, Pilocarpus jaborandi, Nardostachys jatamansi, Phyllanthus emblica, Saussurea lappa, Tinospora cordifolia, Terminalia bellirica, Unscarier gambir, Aloe barbadensis, Cinnamomum zeylanicum, Hibiscus rosasinensis, Centella asiatica etc. are used as main ingredients in hair care preparations mainly for colouring the hair.

10. Rashmi Saxena Pal al., (2023)

People have been using natural dyes since ancient times for the purpose of dyeing carpets, rugs and clothing by the use of roots, stems, barks, berries, fruits and flowers of various dye yielding plants. Heena, Palash Flower, Turmeric, Tea, Beet, Catechu, Reetha, Shikakai, Amla, Tulsi. These are herbs which are well known ayurvedic herbal drugs traditionally used as hair colorant and for hair growth

III. AIM & OBJECTIVES

- The objectives of these present to carry out the formulation and evaluation of polyherbal hair dye from natural resources to enhance natural hair appearance.
- To evaluation of the organoleptic properties, powdered characteristics, physicochemical evaluation and patch test of the prepared formulation.
- To study the method of evaluation is that to minimize the side effects of synthetic and semisynthetic hair dye. 4



Fig 2 : Hair Dyes Samples

IV. DRUG PROFILE

1] *Hibiscus Rosasinesis*

Scientific name: Shoeblackplant.

Synonym: Chinese hibiscus, China rose.

Family: Malvaceae.

Chemical constituents:

Leaves and stems contain β sitosterol, stigmasterol, taraxeryl acetate. and three cyclopropane compounds and their derivatives.

Flowers contain cyanidin diglucoside, flavonoids and vitamins, thiamine, riboflavin, niacin and ascorbic acid.

Biological source: Dried leaves of hibiscus Rosa sinesis.

Plant part used: Leaf Fig (1): *Hibiscus Rosasinesis*

Uses

- *Hibiscus Rosasinesis* nourishes and thickens hair.
- It is used for blackening of hair.
- It is used as laxative.
- It is used for promote hair growth.
- It stops the hair loss.
- It makes your hair healthy and lustrous.
- It acts as natural conditioner.
- It is used to circulate the blood to hair follicles.



Fig (1): *Hibiscus Rosasinesis*

2. Curry leaves

Scientific name: *Murraya koenigii*.

Synonym: Kadi Patta.

Family: Rutaceae.

Chemical constituents: linalool, elemol, geranyl acetate, myrcene, allo-ocimene,

Biological source: The species name commemorates the botanist Johann König.

The genus Murray commemorates Swedish physician and botanist Johann Andreas Murray who died in 1791. Hence the botanical name of the curry leaves is *Murraya koenigii*.

Fig (2): Curry leaves
Plant part used: Leaf

Uses

- It is used to remove dead hair follicles.
- It helps to moisturize the scalp.
- Use prevents hair fall and premature graying of hair.
- It is used as antioxidants.
- It is used for antifungal properties.
- It gives antibacterial properties to hair.
- It provides essential nutrients like copper, minerals, calcium, phosphorous, fiber, carbohydrates, magnesium and iron.



Fig (2): Curry Leaves

3. Amla

Scientific name: *Phyllanthus emblica*

Synonym: Indian gooseberry, Emblic.

Family: Phyllanthaceae.

Chemical constituents: *Emblica officinalis* is very high in vitamin C, pectin, polyphenol compounds, gallic acid, ellagic acid, corilagin, phyllantidine and phyllantine (both alkaloids).

Biological source: Dried fruits of *phyllanthusembilica*.

Plant part used: Fruit.

Uses:

- It is used as hair conditioner.
- It helpful to treat scalp ailments.
- It promotes hair growth.
- It conditions the scalp.
- It minimizes grays.
- It reduces dandruff.
- Amla is rich source of vitamin c, tannins, and minerals such as phosphorus, iron, calcium which provide nutrition to hair and also causes thick and dark hair.



Fig (4) Amla Fruit

4. Shikakai

Scientific name: *Acacia concinna*.

Synonym: Virala.

Family: Leguminosae.

Chemical constituents: Lupeol, spina sterol, acacia acid, lactone.

Biological source: It consist of the fruits of the plant *acacia concinna*, Linn.

Plant part used: Fruit.

Uses:

- It is used as natural hair wash for sensitive scalps or to control dandruff.
- It promotes hair growth.
- strengthen hair roots and lengthy beautiful hair, these is used for herbal hair oil.
- It is used to controls hair fall.
- It prevents dryness.

- Cleans scalp without affecting the natural pH.
- Slows down premature graying of hair.
- Treats dandruff and reduces white flakes



Fig (5): Shikakai Fruit

5. Henna

Scientific name: *Lawsonia inermis*

Synonym: Egyptian privet, *Lawsonia alba*

Family: Lythracea

Chemical constituents: Naphthoquinone compound, a dye molecule, lawsone, in addition to gallic acid, mucilage, and traces of alkaloids.

Biological source: Fresh leaves and branch tops of the eucalyptus plant.

Uses

- Henna reduce hair loss
- Promote hair growth.
- Nourishing the scalp.
- Strands with nutrients important for healthy hair.
- Natural hair colouring agent Prevents Dandruff, henna can avoid production oil and excess grease in the scalp.1

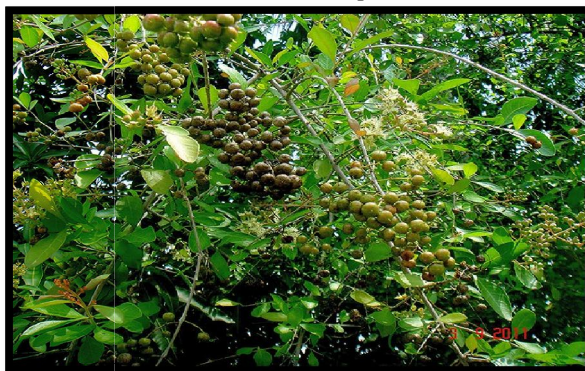


Fig (6) : Henna

6. Aloe-Vera

Scientific name: Aloe barbadensis miller

Synonym: : Aloe, Hindi- musabbar, Kumari

Family: Liliaceae

Chemical constituents: chromone and anthraquinone and its glycoside derivatives.

Biological source: :It is obtained from dried latex of various species of Aloes, namely: Aloe barbadensis Miller (or Curacao Aloe) Aloe ferox Miller (or Cape Aloe); Aloe perryi Baker (or Socotrine Aloe); Aloe africana Miller and Aloe spicata Baker (or Cape Aloe)

Plant part used: leaves

Uses

- Nourishes of hair.
- It is moisturizing effect vehicle.
- Stimulates hair growth.
- It's advantageous in treating the scalp from Sun burn.
- It is utilized as a home grown mordant. ⁶



Fig (7): Aloe-Vera

V. METHODS OF PREPARATION

5.1 Collection of plant materials

Powders of lawsonia inermis (Henna takes off) Hibiscus takes off, Embelica officinalis (Amla natural product), tea leaves were secured from the neighborhood advertise. The powdered fabric was put away in a well closed container.

5.2 Physico-chemical Analysis

Physicochemical values such as the rate of ash values and extractive values were performed according to official strategies endorsed in Indian Pharmacopeia 1996 and WHO rules on quality control strategies for restorative plant fabric.

5.3 Arrangement of Extract

The powdered clears out of henna, tea and Hibiscus, fruits of Amla were extricated with water with three times each by cold maceration at room temperature. In cold maceration, entire powdered plant medicate is kept in contact with the dissolvable in a plug holder for 48 hours with visit disturbance until dissolvable matter is dissolved. The extricates hence gotten were concentrated by refining off the dissolvable under reduced weight by utilizing Rota Evaporator.

5.4 Organoleptic Think about of Powdered Plant Materials

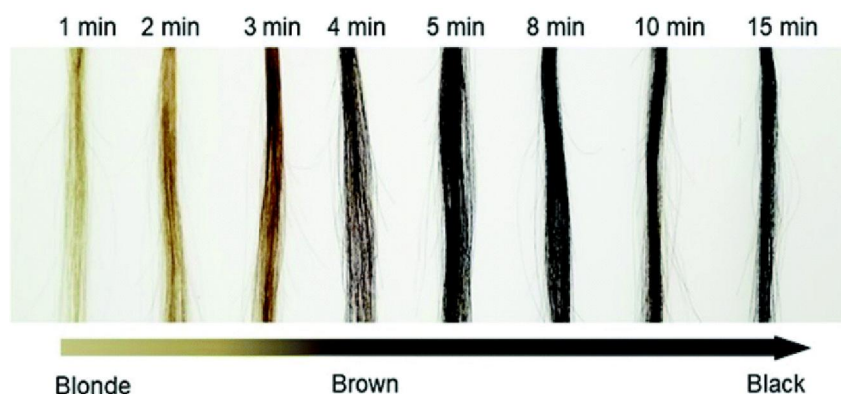
The powder drugs were assessed by its appearance, colour, smell and taste.

5.5 Physicochemical Assessment of Powdered Plant Materials

The person watery extricates were subjected to qualitative chemical examinations for the identification of the phytoconstituents such as sterols, flavonoids, triterpenes, alkaloids, glycosides, tannins, proteins, carbohydrates. The preparatory phytochemical tests were performed for each extract.

5.6 Subjective Investigation of Phytochemical Constituents

The person fluid extricates were subjected to qualitative chemical examinations for the identification of the phytoconstituents such as sterols, flavonoids, triterpenes, alkaloids, glycosides, tannins, proteins, carbohydrates. The preparatory phytochemical tests were performed for each extricate by utilizing standard conventions.⁵



VI. PLAN OF WORK

- 1) Selection of herbs
- 2) Collection and authentication of plant
- 3) Formulation of crude drug
- 4) Physicochemical evaluation
 - Ph
 - Loss on drying
 - Ash value
 - Organoleptic evaluation
 - Phytochemical evaluation
 - Rheological evaluation
 - Patch test
- 5) Stability



EXPECTED OUTCOMES**Physical Parameters:**

1. Color: White to Blackish/Dark brown
2. Viscosity: Medium to thick
3. Texture: Smooth
4. Odor: Characteristics

Chemical Parameters:

pH: 6.7.

Loss on drying : 1.9%

Ash Content : 0.19

Rheological Parameter

Bulk Density : 0.47

Tapped Density : 0.588

Carr's Index : 20

Hausner's Ratio : 1.25

Future directions

It is a labor-intensive industry that gives work openings to all included in the development, extraction and application of these colors to materials. Characteristic colors make economical business and salary for the weaker segment of the population in rustic and peri-urban zones both for coloring and for developing non-food crops to deliver plants for normal colors. - The application of normal colors has the potential to get a carbon credit by decreasing the utilization of manufactured colors based on fossil powers (petroleum).⁹

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