



To Formulate and Evaluate Herbal Hair Dye

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INTRODUCTION

Today most of the human beings are very careful about their beauty and hairs play an important role in this. Graying of hair is major issue in adult and also in teenagers. Continuous application of synthetic or chemical hair dye on natural hair causes multiple side effects such as skin irritation, allergy, hair fall, dry scalp, erythema and also skin cancer. So herbal dyes are being preferred nowadays and demand of herbal based hair dye is increasing fastly due to their natural goodness and lack of side effects. Herbal drugs without any adverse effects are used for healthy hair. Nearly 70% of human beings above 50 years struggle with the problem of balding and graying of hair. In few cases, these symptoms of ageing occur earlier. [3] The age at which graying starts is deeply influenced by heredity. But premature depigmentation in adults is mainly due to variety of other factors like illness, some specific drugs, shock, stress etc. [4] People have been using natural dyes since ancient times for the purpose of dyeing carpets, rugs and clothings 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 colourant and for hair growth. [1]

Many different plant parts used for the purpose of hair dyeing in Europe and Asia before the invention of modern dyes. In India, henna has been used traditionally for colouring hair and women's bodies like palm during marriage and other social celebration. It is parts of Islamic and Hindu culture as a hair coloring and dyeing agents for purpose of decoration of nails or for the formation of temporary skin tattoos. Drugs from the plants sources are easily available are less expensive, safe, and efficient and rarely have side effects.

Natural hair colorants that are currently marketed mainly contain henna along with plant components that need to be used in the paste form. However such preparations have several disadvantages like lengthy preparation time, messy application, poor rinsability, lack of a standard coloring and limited color shades. [1] Formulations promoted as natural hair colorants also contain synthetic dyes and chemicals. Synthetic hair colorants involve the use of chemicals like 1-3 % phenylenediamine, ammonia, peroxide and coal tar dyes that are capable of removing and replacing or covering the natural hair color. Inorganic salts like aluminum sulphate, copper sulphate, lead acetate and potassium dichromate which act as mordants are also added to improve and protect the color produced by the dye. [2] Use of these chemicals can result in unpleasant side effects, including temporary skin irritation and allergy, hair breakage, skin discoloration, unexpected hair color and cancer. The human body apart from areas of glabrous skin, is covered in follicles which produce thick terminal and fine vellushair. Hair fibers have a structure consisting of three layers, starting from the outside, the cuticle, which consists of several layers of flat, thin cells laid out overlapping one another as roof shingles. The cortex, which contains the keratin bundles in cell structure that remains roughly rod-like. The medulla, disorganized and an open area at the fibre's centre.

Most of the synthesis hair coloring agent rely on harsh chemical like phenylenediamine, which have some side effect. The demand of herbal medicines is increasing rapidly due to their lack of side effects. [2] All ingredients used in herbal preparation are well known ayurvedic herbal drugs. Traditionally used as hair colorant and for hair growth. To our best knowledge, there is no scientific report on the combination of these herbal drugs hair dye formulation. Hence, the present study has been designed to formulate and evaluate and polyherbal formulation of henna, palash, beet, kattha, turmeric, tea, reetha, shikakai, amla, tulsi. [1]

Hair dyes include dyes modifiers, antioxidant, alkaline, soaps, amines, wetting agent, fragrance and varieties of other chemicals used in small amounts that impart special qualities to hair such as softening the texture or give a defracting 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. Colorant is classified as being temporary or permanent. [2] In temporary coloring the color can be washed away easily. Permanent coloring of hair involves addition of aromatic diamine or hydroxyphenols or polycompounds such as paraphenylenediamine in the formulation. Continuous usage of such compounds results in many side effects such as skin irritation, erythema, loss or damage of hair and skin cancer. [5]

Composition of herbal dyes and hair coloring mordant can be used to achieve a variety of hair colors to the hair. However, substantial improvement is needed in the areas of color saturation, color development, initial color consistency, improved wash fastness, improve hair conditioning without causing hair damage and skin irritation and of course the cost of the preparation. Because of the manufacturing hazards, environmental pollution, its side and toxic effect 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 resource. The black dye produced from herbal resources may

be used in wide variety of context including hair color products. At this juncture, there is enormous need for a method to increase the yield of such dyes from herbal products.

A dye can generally be described as a colored substances that has an affinity to the fibre , fur or hair . Melanin is what gives color to human skin, eyes, and hair. It's the ratio of two types of melanin Eumelanin and Pheomelani. The desire to look beautiful is human weakness and is as old as the origin of human being itself. Today most of the human beings are very careful about their beauty and haitis play an mportant role in this. Herbal drugs without any adverse effects are used for healthy hair. In some, these symptoms of age arrive much earlier. Graying starts on the scalp about 40 years .[3]

Aim and Objective

Aim:- To formulate and evaluate herbal hair dye.

Objective:- The main objective of this present work is to formulate and evaluate herbal hair dye which have less side effect than synthetic hair dye.

The prepared formulation was evaluated by different parameter like organoleptic, physicochemical, hemical test, rheological parameter.

DRUG PROFILE

Henna:-

Synonyms:- Hina, Mehendi

Chemical constituents:- flavonoids, gallic acid, lawsone, Carbohydrates, terpenoids, flavonoids, naphthoquinones.

Application:-

Henna use to maintain scalp health. It helps to improve hair color.

It use in balance pH level.

It helps in conditioning hair.

It controls hair fall, repairs hair and boosts hair growth.

Figure No. 1 :- Henna



Henna's principle coloring ingredient of is lawsone, a red orange colored compound present in dried leaves of the plant. Lawsone acts as a non oxidizing hair coloring agent . Other constituents in henna such as flavonoids and gallic acid act as organic mordants to the process of colouring . Carbohydrates give the henna paste a suitable consistency for adherence to the hair . Natural henna is usually hypoallergenic but allergic reactions occurred in mixed types including black henna . This occurs due to chemical compounds consisting of para - phenylenediamine , 2 - nitro - 4- phenylenediamine , 4 - aminophenol and 3 - aminophenol . Henna has also antifungal activity against Malassezia species (causative organism of dandruff) . Henna prevents premature hair fall by balancing the pH of the scalp and graying of hair . Henna leaf paste used for alleviating Jaundice , Skin diseases , Smallpox , etc

Henna is also popular for its cooling effect. Henna is use to make healthy, glossy and voluminous hair. It helps bring back lost health of hair and repaire damage lock. Henna restores the acid-alkaline balance of scalp without affecting the natural balance of hair. Henna is very good conditioner also. Henna is known to cure dandruff quite effectively.[11]

Palash:-

Synonyms:- Palas, dhak, dak

Chemical constituents:- coreopsin, isocoreopsin, sulphurein, butein, butin, isobutrin, monospermoside and isomonospermoside, auronnes, chalcones, flavonoids, steroids.

Application:-

it is beneficial in hair loss.

It inhibit damage of hair root.

It improve hair growth and hair texture.



Fig. No. 2 :- Palash

Butea monosperma (BM) is a well-known medicinal plant which is a moderate sized deciduous tree and widely distributed in India, Ceylon and Burma. It has been used in traditional medicine practice from ancient time. It is also known as flame of forest commonly known as Palash or Dhak. Palash is described in Charaka Samhita, Susruta Samhita, Upanisads, Vedas, Astanga Sangraha and Astanga Hridaya. Palash belonging to the family Leguminosae. The pharmacological actions like hepatoprotective, antifertility, antifilarial, anti-diabetic, antiviral, anthelmintic, anticonvulsant, antifungal, antimicrobial, antiestrogenic, anticancer, antiinflammatory, antioxidant, antiulcer, wound healing, anti-diarrhoeal, anti-implantation,

The Chemical constituents of flower is seven flavonoid glycosides like butrin, isobutrin, monospermoside, isomonospermoside, coreopsin, isocoreopsin sulphurein. Palash flower is good for hair health. The application of palash help in hair loss prevention. It prevent damage to the hair roots and follicles and improve overall hair health and hair texture. Palash flower improve colour of hair.[6]

Beet root:-

Synonymes:- beta, chard, blood turnip

Chemical constituents:- betalains, flavonoids, polyphenols, saponins, sodium, phosphorous, calcium, magnesium, iron, zinc.

Application:-

Beet root prevent hair loss. It strengthen hair follicles. Relieves itchy scalp.

Use to treat dandruff.



Fig No. 3 :- Beet Root

Being rich in nutrients, beet juice boosts the circulation of blood throughout the scalp, which stimulates hair follicles and promotes hair growth. The anti-pruritic properties of beetroot help the scalp get rid of dead cells, dandruff, and itchiness while conditioning it thoroughly, Beet useful for hair growth. It helps in improving hair colour. It is a great source of dietary fibers, vitamins (B1, B2, B5, B6, B9 and C) [12]

Kattha:-

Synonyms:- kata

Chemical constituents:- catechin, catechu tannic acid, tannin, L-glucuronic, galactose

Application:-

Kattha enhance volume, shine, and color of hair.

It act like conditioner.

It help in strengthen hairs.



Fig No. 4 :- Kattha

Acacia catechu has a long history as a medicinal plant in China based on its wide spectrum of biological and pharmacological activities. Traditionally, A. catechu has commonly been used to kill parasites. alkaloids and condensed tannins have been identified as the characteristic constituents.

Katha Powder is a nutrient-dense natural hair product that treats the root and scalp, giving it the nourishment and moisture it needs. Katha Powder has historically been used in hair care remedies to enhance the volume, shine, and color of the hair. Unlike other hair conditioners, this product leaves a lasting impression. Regular use of Katha Powder conditioner will add volume and strength to your hair.[7]

Turmeric:-

Synonyms:- haladi, Indian saffron, manjal

Chemical constituents:- curcumin, demethoxycurcumin, bisdemethoxycurcumin, dihydrocurcumin.

Application:-

Turmeric prevent hair loss.

It helps to maintai scalp health. It helps to treat dandruff.

It act as oil controler.[9]



Fig No. 5 :- Turmeric

Turmeric is a small perennial herbaceous plant , bearing many rhizomes which are aromatic and pigment yellow orange - red . Three principal pigments are present in the rhizomes curcumin, desmethoxy curcumin and bisdesmethoxy curcumin , which are collectively known as curcuminoids.[8]

Turmeric has played a traditional role as a crude dyestuff in cosmetic . The paste of turmeric powder has been used as antiseptic and for skin nourishment since centuries.[10]

Tea:-

Synonymes:- Camellia thea

Chemical constituents:-Catechin, epicatechine, epigallocatechin, epigallocatechine gallate, L- theanine.

Application:-

Tea soothes irritated scalps. It keeps hair soft and shiny.

It helps to improve hair color. It prevent split ends.

It decreases hair loss.

It promote hair growth.[13]



Fig No. 6 :- Tea

Being rich in polyphenols, selenium, copper, phytoestrogens, melatonin. Tea also has been used in traditional Chinese medicines and in Ayurvedic medicine has been used since long as hair colourant.[1]

Amla:-

Synonyms:- emblica, Indian gooseberry

Chemical constituents:- vitamin-c, minerals, amino acid, alkaloids, tannin, gallic acid pectine.

Application:-

Amla improve the tone of hair dyes. It pramote healthy hair growth.

It condition scalp. It minimize grays.

It boost volume of hair.

It treat dandruff and head lice.



Fig No 7 :- Amla

Berries obtained from amla enhances the absorption of calcium, helping to make healthier bones, teeth, nails, and hair . It maintains the hair color and prevents premature graying, strengthens the hair follicles. Amla is the most rich and concentrated form of Vitamin C along with tannins found among the plants. Whole fruit is used as an active ingredient of the hair care preparations. The Vitamin C found in the fruit binds with tannins that protect it from being lost by heat or light . This fruit is also rich in tannins, minerals such as Calcium, Phosphorus , Fe and amino acid. The fruit extract is useful for hair growth and reduce hair loss. Amla has antibacterial and antioxidant properties that can help promote the growth of healthy and lustrous hair .[1]

Reetha:-

Synonyms:- Indian soapberry

Chemical constituents:- saponins, steroids, starch, sugar, protein, sapindosides, fatty acids.

Application:-

Reetha stimulate better hair growth. It act as foaming agent.

It show anti-dandruff activity. It use as hair tonic.[14]



Fig No. 8 :- Reetha

Reetha fruit is rich in vitamin A , D , E , K , saponin , sugars , fatty acids and mucilage. Reetha extract is useful for the promotion of hair growth and reduced dandruff . Extract of fruit coat acts as a natural shampoo , therefore is used in herbal shampoos in the form of hair cleanser , Reetha as soapnuts or washing nuts , play an important role as natural hair care products since older times . This plant is enriched with saponins , which makes the hair healthy , shiny , and lustrous when used on regular basis.[1]

Shikakai:-

Synonymes:- acaciaconcinna

Chemical constituents:- acacia acid, spinasterol, arabinose, rhamnose, hexacosanol, oxalic acid, spinasterones, citric acid, calyctomine, ascorbic acid.

Application:-

It is antidandruff agent.

It foaming and cleaning agent.[15]



Fig No. 9:- Shikakai

Shikakai contains Lupeol , Spinasterol , Lactone , Hexacosanol , Spinasterone, Calyctomine , Racimase - A Oleanolic acid , Lupenone , Betulin , Betulinic acid , Betulonic acid. The extract obtained from its pods is used as a hair cleanser and for the control of dandruff. Shikakai or acacia concinna , has rich amount of vitamin C , which is beneficial for hair. Shikakai naturally lowers the pH value and retains the natural oils of the hair and keeps them lustrous and healthy . It is also effective in strengthening and conditioning hair. Amla , reetha and shikakai compliments each other , therefore , they are mixed together to have healthy and lustrous hair . All of these ingredients come in two forms , one as a dried fruit and other in powdered form. Amla, reetha, shikakai suit all hair types and helps prevent slit ends, hair fall, dandruff, greying of hairs and other hair related problems, to make hair soft and silky.[1]

Tulsi:-

Synonymes:- holy basil, vrinda.

Chemical constituents:- oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, caryophyllene, minerals, vitamin-A,C,K.

Application:-

Tulsi helps to maintain moisture in scalp. It improve blood circulation.

It reduce itchiness and dryness. It strengthen hair follicles.



Fig No. 10 :- Tulsi

Tulsi acts as a blood purifier when consumed raw . Applyng it on the scalp may help you to maintain the moisture in the hair and it also help in preventing dandruff , hair fall and itchiness. Tulsi is the regarded as a sacred hern in India and has been used for about 5000 years . It is acclaimed for this healing properties of the mind , body and spirit . Tulsi contains may beneficial compound and is has storage antioxidant , antibacterial , antiviral and immune enhancing properties . Tulsi is considered to be an adaptogenic herb , balancing different processes in the body and enabling the body to adapt to stress . It is traditionally used for combating hair loss . dandruff and itchy scalps and for promoting helthy skin and shining hair .[16]

FORMULATION

For the preparation of herbal hair dye, we have to select ingredients which are good for hair colouration and good for hair health such as Heena, palash, Beet, kattha, Turmeric, Tea, Retha, Shikakai, Amla, Tulsi.

All ingredients were collected and then dried and coarsely powdered.

Then all ingredients were mixed uniformly to prepare a homogenous formulation. The composition of the formulation is reflected in the next table.

Formulation table:-

sr.no	Ingredient	Quantity(gm)		
		F1	F2	F3
1	Heena	11	10	07
2	palash	10	12	07
3	Beet	03	3.5	09
4	kattha	3.5	03	05
5	Turmeric	03	2.5	05
6	Tea	05	06	06
7	Retha	04	04	03
8	Shikakai	3.5	03	03
9	Amla	04	04	03
10	Tulsi	03	02	02
	Total	50	50	50

Table No. 1 :- Formulation Table

Formulation table:-

Sr.no	Ingredient	Quantity (%)		
		F1	F2	F3
1	Heena	22	20	14
2	palash	20	24	14
3	Beet	06	07	18
4	kattha	07	06	10
5	Turmeric	06	05	10
6	Tea	10	12	12
7	Retha	08	08	06
8	Shikakai	07	06	06
9	Amla	08	08	06
10	Tulsi	06	04	04
	Total	100	100	100

Table No. 2 :- Formulation Table**Evaluation of the herbal hair dye:-**

The prepared herbal hair dye was evaluated for its various parameters such as preformulation evaluation, organoleptic, phytochemical, rheological aspects.

Pre-formulation evaluation:-

Sr. No.	Formulation	Bulk density	Tapped density	True density	Angle of Repose
1	F1	0.44	0.66	0.88	26.92
2	F2	0.42	0.71	1.20	27.02
3	F3	0.41	0.62	1.27	26.68

Table No. 3 :- Pre-formulation Evaluation**Organoleptic evaluation:-**

Organoleptic characteristics for various sensory characters like color, odour, texture, appearance was care fully noted down illustrated.

Sr. No.	Parameter	F1	F2	F3
1	Colour	Greenish Brown	Greenish Brown	Reddish Brown
2	Odor	Characteristic	characteristic	characteristic
3	Texture	Fine	Fine	Fine
4	Appearance	Powder	Powder	Powder

Table No. 4 :- Organoleptic Evaluation**Physico-chemical evaluation:-**

Physical and chemical features of herbal hair dye were evaluated to determine the pH, its moisture content, its ash value for the purpose of stability, compatibility and amount if inorganic matter present in it.

Sr. No.	Parameter	F1	F2	F3
1	pH	5	6	5
2	L.O.D	3.2	3.1	3.4
3	Ash Value	0.67	0.78	0.78

Table No. 5 :- Physico-Chemical Evaluation

Chemical test evaluation:-

Prepared herbal hair dye was subjected to chemical screening to reveal the presence or absence of various chemical constituents such as carbohydrate, alkaloids.

Sr. No.	Parameter	F1	F2	F3
1	Foam Test	Present	Present	Present
2	Molisch's test	Present	Present	Present
3	Fehling's test	Absent	Absent	Absent
4	Mayer's test	Present	Present	Present

Table No. 6 :- Chemical Test Evaluation

Patch test:-

This is usually involves dabbing a small amount of aqueous solution of hair dye behind the ear in an area of 1sq.cm and leaving it to dry. Signs of irritation or feeling of non wellness is noted, if any. Measured and small quantities of prepared hair pack were applied to the specified area for fixed time. Irritancy, redness, and swelling were checked and noticed for regular intervals up to 24 hours. The results of tests for the signs of irritation are displayed in table below

Sr. No.	Parameter	F1	F2	F3
1	Swelling	Negative	Negative	Negative
2	Redness	Negative	Negative	Negative
3	Irritation	Negative	Negative	Negative

Table No. 7:- Patch Test

Stability test:-

Stability testing of the prepared formulation was performed by storing it at different temperature conditions for the time period of one month . The packed glass vials of formulation were stored at different temperature conditions room temperature and 35 ° C and were evaluated for the physical parameters like color , odour, pH , texture , and smoothness as highlight.

Formulation	At room temperature				At 35c			
	color	Odour	pH	Texture	color	Odour	pH	Texture
f1	Greenish brown	Characteristics	5	Fine	Greenish brown	Characteristics	5	Fine
f2	Greenish brown	Characteristics	6	Fine	Greenish brown	Characteristics	6	Fine
f3	Reddish brown	Characteristics	5	Fine	Reddish brown	Characteristics	5	Fine

Table No. 8 :- Stability Test

APPLICATION OF HAIR DYE

The pack which is in the form of powder, should be used weekly on wet hair, forming a paste in water with optimum consistency. It should be applied evenly on hair with the help of brush, covering the roots to the hair tip. The scalp should be covered. It should be left for 2-3 hour on the scalp for complete drying. Then it should be removed by washing with plain water.

Caution:- apply small amount of of the dye as a prepared for use to the area and allow it to dry. After twenty-four hours wash the area gently with soap and water. If no irritation or inflammation is apparent, it may be assumed that no hypersensitivity to the dye exists.

Dye study:-



Fig No. 11 :- Dye Study

Dye study:-

Figure A1 is before dyeing and figure A2 is after dyeing with first formulation. Figure B1 is before dyeing and figure B2 is after dyeing with second formulation. Figure C1 is before dyeing and figure C2 is after dyeing with third formulation.

RESULT AND DISCUSSION

The prepared hair dye contains all goodness of natural ingredients. Apart from acting as a hair dye, this formulation because of goodness of herbs used in this formulation also act as the hair growth promoter, hair nourishers, conditioners and anti-dandruff agent as well. Henna acting as the base powder

and coloring ingredients. In this preparation five ingredient used as coloring ingredient other than henna that are palash flower, beetroot, kattha, turmeric, tea. These six coloring ingredients also act as nourishing, conditioning, anti dandruff, hair growth promoter and antioxidant. This formulation includes reetha, shikakai, amla, tulsi as nutritive ingredients.

Organoleptic evaluation findings revealed that the dye is smooth and pleasant smelling powder . Physicochemical parameters reflected that the moisture content was as minimal pH was found neutral to suit the requirements of different scalp types . Ash value was found to be nominal

. It shows the presence of major phytoconstituents , which acts as true nourisher for the scalp as well hair . Irritancy test revealed negative results irritancy , redness and swelling. From the above observations, it has been signified that since the formulation is constituted with naturally occurring dried herbal ingredients , there are almost minimal possibilities of the deterioration of the formulation , as there is no moisture containing substance in either raw or processed form . The formulation was kept for one month at room temperature to observe the changes in its color , odour

, texture and appearance . The pH was also noticed before and after one month . The formulation was found to be stable . It can be easily stored and used at any temperature , at any place . Since it is a natural herbal based formulation , it is free from the ill - effects of ammonia based chemical dyes . However , the regular use of it provides smooth and well coloured hair . Its continuous use shows superb effects later on . Since natural ingredients are known for their non - toxic , non - habit forming properties and no chemicals , preservatives , artificial colors or perfumes has been incorporated in the pack , the chances of its degradation are almost close to the minimal .

This study exhibits a powder based formulation of plant powder which is ready to use. From dyeing study it is evident that all powder formulation showed dyeing effect. Formulation 1 showed the more dyeing effect than other two formulations.so foprmlation one has good dyeing properties with adequate stability.

CONCLUSION

A herbal hair dye color the hair in an utmost gentle manner. The advantages of herbal based hair cosmetics are their nontoxic nature. Frequent use of this dye leads to managing frizz free and colored hair. Pollution, aging, stress and harsh climates badly affect the quality of hair. In this study, we found the effective properties of herbal hair dye. Nowadays herbal remedies are widely accepted with open hands because of minimal side effects as compared to synthetic cosmetics. Herbal formulations are in great demand to fulfill the needs of the growing market. It is a noticeable attempt to formulate the herbal hair pack containing the goodness of powder of different plants, which are excellent for hair care and hair color. This study exhibit a powder based formulation which is stable and easy to use. This developed formulation has excellent dyeing property. It also imparts additional benefits such as promotion of hair growth and prevention of hair greying while being safe and eco friendly.

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