

Formulation and Evaluation of Herbal Hair Dye

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Submitted: 25-11-2023

Accepted: 05-12-2023

I. 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, Beet, Reetha, Shikakai, Amla, Hibiscus. These are herbs which are we 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. 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 colour 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 roof shingles. The cortex, which contain the keratin bundles in cell structure that remains roughly rod-like. The medulla, disorganized and an open area at the fibres centre.

Most of the synthesis hair coloring agent reply in harsh chemical like phenylenediamine, which have some side effect. The demand of herbal medicines is increasing rapidly due to their lack of side effect's.⁽²⁾ All ingredient 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 formulation and evaluate and polyherbal formulation of Heena, beet, reetha, shikakai, amla, hibiscus.⁽¹⁾

Hair dyes include dyes modifiers, antioxidant, alkalines, soups, aminis, 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 defred 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. In temporary coloring the color can be washed away easily. Permanent coloring of hair involves addition of aromatic diamine or hydroquinones 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.⁽⁶⁾

A dye can generally be described as a colored substance 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 Pheomelanin. 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 hair play an important 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⁾

Types of hair dyes :-

1. Temporary:-

1. These type of hair colours used to colour the hair for temporary.
2. The colorants which are used doesn't penetrate into the hair or surrounding.
3. Can be easily rinsed off water one shampooing.

4. Temporary hair coloring some time used to apply finely ground metals by means of a Puffer Spray.

5. Such metals, which include orosasse, bronze and aluminum, both untreated and anodized in Various colors, it provide metallic effect when applied to hair, mainly used for high lighting.

6. Powders, setting lotions, crayons are used for temporary color.

7. Temporary hair coloring may also achieved by using the leuco derivative of a basic dye like Crystal violet.

8. The various type of products used for temporary coloring of hair include rinse, lotion, aerosols, Crayons etc.

9. In rinse aqueous or hydro alcoholic solution of simple dye stuffs are used.

10. In lotions dye in solution with a transparent polymer, such as 3% polyvinyl pyrrolidone in water Or aqueous alcohol.

11. Crayons are used either directly rubbed on to the wet hair or applied with the help of hair brush.

2. Semipermanent:-

1. Most of them are basic dye stuffs, whose cationic character gives them a natural affinity for the Hair.

2. Metalized dye stuffs in combination with nitro derivatives of aromatic diamines or Aminophenols.

3. Performance of colorants can be enhanced by the inclusion of solvent.

4. Shampoo is the most commonly used base.

5. Semipermanent dye contains mainly either Nirtophenylene diamines either Nitroaminophenes Or either Aminoanthraquinones.

3. Permanent :-

1. Most popular hair dye products.

2. The dyes are formed during the dyeing process and are not present, as such in the solution before application.

3. Consists of two parts

. Dye intermediate

. Oxidizing agent

4. Dye intermediates are blends of primary intermediates and coupling agent or modifier, in a suitable base.

5. During dyeing of hair, the intermediate solutions are mixed and applied to the hair.

6. The primary intermediates are gradually oxidized and then undergo coupling reaction with Modifiers.

7. Permanent dye systems are able to dye hair a lighter shade than the original.

8. These dye are capable of confusing the difference in color between individual hair.

9. Very effective on mixed colored white hair and black hair.

10. They cause some hair damage. ⁽⁹⁾

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, chemical test, rheological parameter.



DRUG PROFILE

Henna:-

Synonyms:- Hina, Mehendi.

Chemical constituents:- flavonoids, gallic acid, lawsone, Carbohydrates, terpened, flavonoids.



Fig No. 1- Heena

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.

Henna's principle coloring ingredient of is lawsone, a red orange colored compound present in dried leaves of the plan. Lawsone acts as a non oxidising 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 pate a stable consistency for adherence to the hair. ⁽¹²⁾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-amino phenol and 3 aminophenol. Henna has also antifungal activity against *Malassezia* species (causative organism of dandruff) Henna prevents premature hair fall by balancing the pill of the scalp and graying of hair Henna leaf paste used for alleviating Jaundice, Skin diseases, Smallpox, etc.⁽⁸⁾

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 repair 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⁾

Beet root:-

Synonyms:- beta, chard, blood turnip.

Chemical constituente:- betalains, flavonoids, polyphenols, saponins, sodium, phosphorus, calcium, magnesium, iron, zinc.

Application

Beet root prevent air.
It strengthen follicle's.
Use to treat dandruff.



Fig No. 2- Beet Root

Being rich in nutrients, beet juice boosts the circulation of blond 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 ham growth. It helps in improving hair colour. It is a great source of dietary fibers vitamins (BI, B2, B5. B6, B9 and C).⁽¹²⁾

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 promotes healthy hair growth.
It condition scalp.
It minimize grays.
It boost volume of hair.
It treat dandruff and head lice.⁽⁶⁾



Fig No. 3- 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.⁽¹²⁾ 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. 4- 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.⁽¹⁵⁾ 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:-**Synonyms:-** acaciaconcinna**Chemical constituents:-**acacia acid, spinasterol, arabinose, rhamnase, hexacosanol, oxalicacid, Spinasterones, citric acid, calyctomine, ascorbic acid.**Application:-**It is antidandruff agent.It foaming and cleaning agent.⁽¹⁵⁾

Fig No. 5- 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.⁽¹⁴⁾ 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⁾

Hibiscus:-**Synonyms:-**roselle, omutete, or sorrel.**Chemical constituents:-**anthocyanins and polyphenols (protocatechuic acid and quercetin).**Application:-**

Hibiscus is used in natural dyes

It is used in hair masks.

It is used to prevent premature greying of hair.

It is rich in vitamins and antioxidants.⁽¹⁰⁾

Fig No. 6- Hibiscus

Hibiscus acts as a natural ultra-emollient that traps moisture in your hair and prevents your hair from becoming dry and frizzy. Hibiscus leaves and flowers contain a high amount of mucilage that acts as a natural conditioner and restores elasticity in your hair.⁽¹⁶⁾ It makes your hair silky and smooth and prevents split ends. Hibiscus is a perfect vegetable powder for hair, scalp or face nourishing. It's full of antioxidants and vitamin C, that's why it efficiently regenerates hair or scalp. It slows down even face skin ageing and protects from skin inflammation.⁽⁹⁾

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, Beetroot, Hibiscus, Shikakai, Amla, and Reetha. 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.	Ingredients	Quantity(gm)		
		F1	F2	F3
1	Beetroot	16	14	15
2	Hibiscus	09	13	10
3	Shikakai	05	05	07
4	Reetha	06	04	04
5	Amla	05	06	04
6	Heena	09	08	10
	Total	50	50	50

Table no.1 Formulation table

Formulation table

Sr. No.	Ingredients	Quantity(%)		
		F1	F2	F3
1	Beetroot	32	28	30
2	Hibiscus	18	26	20
3	Shikakai	10	10	14
4	Reetha	12	08	08
5	Amla	10	12	08
6	Heena	18	16	20
	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.

Preformulation 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	0.71	0.71	1.20	27.02
3	F3	0.41	0.62	1.27	26.68

Table No. 3. Preformulation evaluation

Organoleptic evaluation:-

Organoleptic characteristics for various sensory characters like colour, odour, texture, appearance was carefully noted down illustrated.

Sr. No.	Parameter	F1	F2	F3
1	Colour	Reddish brown	Reddish brown	Reddish brown
2	Odour	Characteristics	Characteristics	Characteristics
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, it's moisture

content, it's 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 area of 1sq.cm and leaving it to dry. Signs of irritation or feeling of non wellness is noted. 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 35°C			
	Colour	Odour	Ph	Texture	Colour	Odour	Ph	Texture
F1	Reddish Brown	Characteristics	5	Fine	Reddish Brown	Characteristics	5	Fine
F2	Reddish Brown	Characteristics	6	Fine	Reddish Brown	Characteristics	6	Fine
F3	Reddish Brown	Characteristics	5	Fine	Reddish Brown	Characteristics	5	Fine

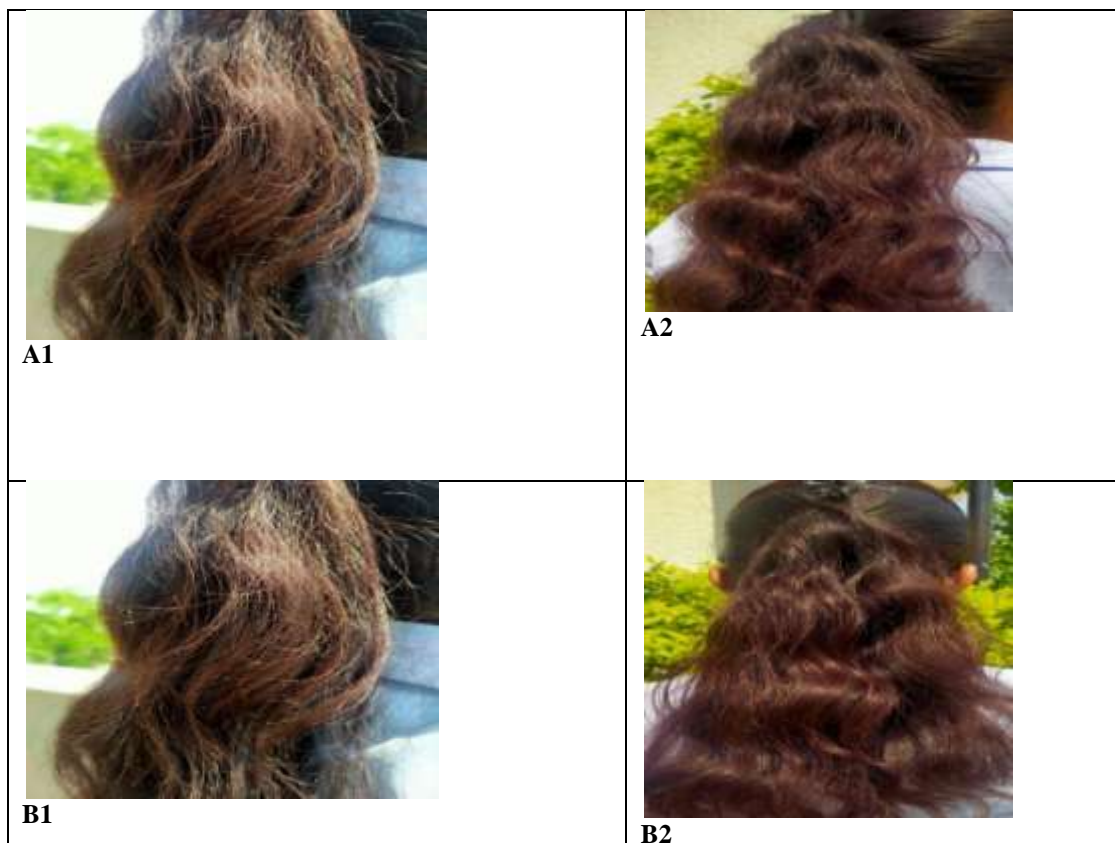
Table No. 8 . Stability test

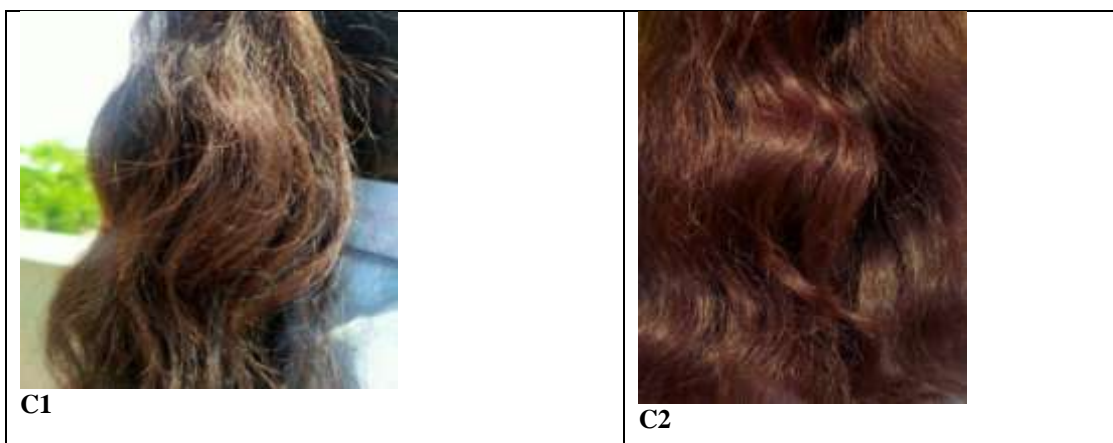
Application Of Hair Dye:-

The pack which is in the form of powder, should be applied weekly on wet hair, forming 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 plane water.

Caution:- apply small amount of the dye as a prepared for use to the area and allow it to dry. After 2-3 hours wash the area gently with water. If no irritation or inflammation is apparent, it may be assumed that no hypersensitivity to the dye exists.





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.

II. 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, katha, 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 formulation one has good dyeing properties with adequate stability.

III. CONCLUSION

A herbal hair dye colors the hair in outmost 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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