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Research Article

Formulation And Evaluation of Multipurpose Polyherbal Powder Shampoo

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ABSTRACT

Shampoo is a hair care product, that is used for cleaning hair. The aim of the present work was to develop a multipurpose polyherbal powder shampoo. Here the multipurpose means antidandruff action as well as hair dye action. Dandruff is a chronic scalp condition characterized by scaling, itching and redness of the scalp. Hair dye is usually a substance of synthetic or natural origin, which is used to colour the hair as per the desired shade. In this work various plants such as Wrightia tinctoria, Eclipta prostrata, Morinda citrifolia, Cyclia peltata, etc were collected, dried, size reduced, weighed, mixed, sieved, packed and labelled. In this work a total of six formulations were made using different ingredients and among these a best formulation were selected. Various evaluation tests were carried out in order to select a best formulation such as stability studies, invitro agar well diffusion method, cleaning action, wetting action, foaming ability, foam stability, dirt dispersion test etc. This work mainly focused to avoid the harmful side effects of the chemically synthesized shampoo and to achieve a better antidandruff as well as hair dye action from a single herbal formulation and from the study such a formulation were made.

INTRODUCTION

HERBAL MEDICINE

Herbal medicines are used to treat diseases and enhance general health and wellbeing. Herbal medicines are also known as herbal remedies,

phytomedicines or phytotherapy. They are still the most widely used system of medicine. Due to its natural origin and less side effects, herbal medicines still flourish and are finding remarkable acceptance in both developed and developing

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countries. The medicinal plants has a great importance in the human being as it shows various pharmacological properties. Phytochemicals were used by the man for the treatment of various diseases like microbial infections, cardiovascular disorders, carcinogenic complications, metabolic disorders etc. According to the current research, the use of herbal medicines are increasing throughout the world than conventional drugs.

According to World Health Organization, it is determined that 80% of the world population only depends upon herbal medicines for the treatment of various diseases. Plant based medicines are used for the treatment of various diseases such as inflammation, wound healing, skin infections, psoriasis, leprosy, ulcers etc. Today the novel formulations are reported to have more significant advantages over conventional formulations which include enhancement of bioavailability, solubility, pharmacological activity, stability, sustained delivery, protection from toxicity, physical and chemical degradation.

HERBAL COSMETICS

Herbal cosmetics are also called as natural cosmetics. Herbal cosmetics are defined as the beauty products, which possess desirable physiological activities, such as skin healing, smoothening, to improve appearance, enhancing and conditioning properties with the help of herbal ingredients. Herbal cosmetics are the products which are formulated using various permissible cosmetic ingredients to form the base in which one or more herbal ingredients are used to provide defined cosmetic benefits. The best thing of the herbal cosmetics is that it is purely made by the herbs and shrubs and thus herbal cosmetics are considered as side effects free. The natural contents in the herbs provides nutrients and other useful minerals to the human body. Herbal cosmetics are the products in which herbs are used in crude or extract form. Herbs do not produce

instant cure. They offer a way to put the body in proper tune with nature.

HAIR COSMETICS

Hair care products are referred as the formulations meant for cleaning, imparting the color, modifying the texture, nourishing the hair, giving life to the stressed hair and to give healthy looks to the hair. Hair care products include hair oil, shampoo, hair dye, hair strengtheners and depilatories.

ANATOMY OF HAIR

Hair is a keratinous filament growing out of the epidermis. Hair is one of the vital parts of the body and is considered to be the accessory structure of the integuments along with sebaceous gland and sweat gland. They are also known as epidermal derivatives as they originate from the epidermis during embryological development. They can also act as sense organs and the main functions of the hair follicles include regulation of body temperature, protection, evaporation of perspiration and draining of external water from the body.

Hair root:

The hair root is located in the skin and extends down to the deeper layers of the skin. It is surrounded by the hair follicle, which is also connected to the sebaceous gland. Each hair follicle is attached to a tiny muscle called arrector pili that can make the hair stand up. As new hair cells emerge, the old cells move upwards, die slowly and forming hard hair shaft through a process called keratinization. Then, they germinate like seedlings from the epidermis through the dermis.

Hair shaft

Hair shaft is the visible part of the hair that sticks out of the skin. The hair shaft is composed of three concentric layers, the outer cuticle, middle cortex, and inner medulla. They differ from each other in the types of keratin filaments they possess.

Cuticle: It is the outermost part of the hair shaft. It helps to protect the inner layers of the hair from



damage and provides shine. It is comprised of overlapping cells that resemble fish scales. Healthy hair has a smooth, flat cuticle that is translucent and reflects light, making hair feels smooth and look shiny. If the cuticle is damaged, the hair feels rough and becomes vulnerable to chemical and mechanical damage.

Medulla: Medulla is the innermost layer of the hair shaft. It is composed of two or three rows of polyhedral cells containing pigment granules and air spaces. This is the most soft and fragile layer of the hair shaft.

Cortex: It is located between the hair cuticle and medulla and is the thickest hair layer. It contain most of the hair's pigment. The major pigment in the cortex is melanin which is also present in skin.

DANDRUFF

Dandruff is a common condition that causes the skin on the scalp to flake. It is not contagious or serious. But it can be embarrassing and difficult to treat. It is characterized by presence of corneocytes that form clusters due to their high cohesive power, in the form of flaky white to yellowish scales, accompanied by itching. It has been observed that dandruff occurs mainly between puberty to middle age.

Three factors which is involved in the formation of dandruff are sebaceous gland secretions, Malassezia fungi, individual susceptibility. According to the symptoms, dandruff is classified as follows:

Dry dandruff: It is characterized by excessive formation of white grayish or ashen colored minute scales.

Oily dandruff: It arises on the scalp skin with varied intensity of sebum production.

TREATMENT OF DANDRUFF

Dandruff can be controlled and effectively treated by using various formulations. The formulation must be suitable for the hairy region and it should be compatible with the dandruff condition. There are different types of formulation like creams,

shampoos, emulsions, lotions, hair oil and other cosmetic formulation containing anti-dandruff agents are readily available in the market to control dandruff. Out of which shampoos are the most common as well as a worldwide accepted cosmetic product used against dandruff.

A shampoo can be defined as a preparation of soap or detergent used to wash hair and which helps to control and reduce dandruff. Anti-dandruff shampoo is intended to kill dandruff, causing fungi that live on your scalp. The function of shampoo is to remove dirt, surface grease, and skin debris from the hair shaft and scalp without affecting adversely the hair, scalp or health of the user. Surfactants are the main component of shampoo. The raw materials used for the manufacture of shampoos are;

Primary surfactant: Sulfonates, Sulfides

Secondary surfactant: Sulfosuccinates

Anti-dandruff agents: Herbal extracts

Conditioning agent: Glycerin, Propylene glycol

Perfumes: Fruity or floral fragrances

Preservatives: Methyl paraben



ANTI-DANDRUFF SHAMPOO

The anti-dandruff shampoo is a preparation that contains anti-dandruff agents that are intended to reduce and treat the formation of dandruff flakes. Two types of anti-dandruff shampoos are commercially available:

1. Synthetic anti-dandruff shampoos (based on chemical ingredients)

These formulations include therapeutic use of anti-dandruff agents that are classified into three groups according to their mechanism of action:

Keratolytic substances

Cytostatic substances

Fungicidal substances

Some of the marked synthetic anti-dandruff shampoos are All Clear shampoo, Pantene Pro-V shampoo, Head and Shoulders shampoo etc.

DISADVANTAGES OF SYNTHETIC ANTI-DANDRUFF SHAMPOOS

Continuous use of synthetic anti-dandruff shampoos makes hair brittle and causes dryness of

the scalp. Anti-dandruff products such as cytostatic and keratolytic agents work only symptomatically, and often reoccurrence of dandruff after stopping treatment is observed.

HERBAL ANTIDANDRUFF SHAMPOO

Herbal anti-dandruff shampoos are the cosmetic preparations or formulations which contain herbal ingredients such as plant extracts and essential oil. These herbal shampoos are generally used to remove the dandruff, to add natural color to the hair, to remove the extra oil content of the hair, to remove the dust, dirt and scales of scalp, for the healthy growth of the hair, to prevent hair falling, to impart softness and smoothness to the hair shaft etc. There are large number of herbs which have beneficial effects on hair and are commonly used in shampoos.

MATERIALS AND METHODS

List of materials:

1: Plant materials used for the formulations

Sl.No	Botanical Name	Vernacular Name	Source/supplier
1	Morinda Citrifolia	Noni	Indoor venture
2	Eclipta Prostrata	Brinkaraj	Indoor venture
3	Lawsonia Inermis	Henna	Indoor venture
4	Phyllanthus Emblica	Amla	Indoor venture
5	Cyclea Peltata	Padathali	Indoor venture
6	Clitoria Ternatea	Butterfly Pea	Indoor venture
7	Mussaenda Frondosa	Vellila	Indoor venture
8	Nigella Sativa	Black Cumin	Indoor venture
9	Sida Cordifolia	Kurunthotti	Indoor venture
10	Camellia Sinensis	Tea Powder	Indoor venture
11	Hibiscus Rosa Sinensis	Hibiscus	Indoor venture
12	Plectranthus Barbatus	Panikoorka	Indoor venture
13	Trigonella Foenum Graecum	Fenugreek	Indoor venture
14	Acacia Concinna	Shikakai	Indoor venture
15	Bacopa Monnieri	Brahmi	Indoor venture
16	Sapindus Mukorossi	Reetha	Indoor venture
17	Aloe Barbadensis	Aloe Vera	Indoor venture
18	Xanthomonas Campestris	Xanthan Gum	Crescent biologics private limited

2: List of chemicals

SI No	Materials/ Solvents	Manufactures/ Suppliers
1	Sabouraud dextrose	AGS Aqua Tech
2	Ethanol	Peer Chemical Industries
3	Molisch's reagent	Bio Diagnostics
4	Fehling's reagent	Bio Diagnostics
5	Hager's reagent	Bio Diagnostics
6	Sudan III	J J Diagnostics

3: List of equipments

SI. No	Equipments	Suppliers/ Manufactures
1	Mortar and pestle	Universal agencies
2	Digital weighing balance	SHIMADZU AY 220
3	PH meter	Jain-LT-10/Labtronics
4	Muffle furnace	Set win
5	Hot air oven	CAT-NO-RHO-14/ROTEK
6	Incubator	Medwin Diagnostics
7	Desiccator	Kawanan international, Kannur

Determination of physicochemical parameters**1. Ash value**

A. Total ash: About 2g of the powdered drug were accurately weighed and it is transferred to silica crucible which were previously weighed. It is then heated at a temperature in a muffle furnace until it is carbon free. The silica crucibles were taken out from the muffle furnace and placed in a desiccator. It is then weighed and percentage of total ash with reference to the air dried drug

$$\% \text{Total ash} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

B. Acid insoluble ash: Total ash obtained were taken in to a beaker and are boiled for about 3minute in 25ml of dilute sulfuric acid and then filtered through a Whatman filter paper and residues were washed with hot water until it is free from chlorides. The residue containing filter paper were taken and placed in different silica crucibles and ignited in muffle furnace 550+20°C for 1 hour. It is then cooled and percentage of acid insoluble ash was calculated with reference to air dried drug.

$$\% \text{Acid insoluble ash value} = \frac{\text{weight of total ash} - \text{weight of acid insoluble ash}}{\text{Weight of crude drug taken}} \times 100$$

C. Water soluble ash value: Total ash obtained was taken and it is poured into a beaker and boiled for about 5minute in 25ml of water. It is then filtered and residues were washed with hot water. The residue containing filter paper were then placed in different silica crucibles and ignited in muffle furnace at temperature 450°C to constant weight. It was then cooled and percentage of water soluble ash was calculated with reference to the air dried drug.

$$\% \text{water soluble ash value} = \frac{\text{Weight of total ash} - \text{Weight of water soluble ash}}{\text{Weight of crude drug taken}} \times 100$$

2. Extractive value:**a) Water soluble extractive value**

Accurately weighed about 5g of air dried powdered plant material were taken in 100ml chloroform water in a closed flask for 24 hours. During the first 6 hours it was shaken and filtered. 25ml of the filtrate were evaporated to dryness in a flat bottomed petridish and dried



105°C and weighed. Then the percentage water soluble extractive values were calculated with reference to the air dried drugs.

b) Alcohol soluble extractive value

Accurately weighed about 5g of air dried powdered plant material were taken in closed flask and 100ml of 95% ethanol was added into it. During the first 6 hours it was shaken frequently and filtered. 25ml of the filtrate were evaporated

to dryness in a flat bottomed petridish and dried at 105°C and weighed. Then the percentage ethanol soluble extractive values were calculated with reference to the air dried drugs.

FORMULATION OF MULTIPURPOSE POLYHERBAL POWDER SHAMPOO

Formula of the composition of Multipurpose powder shampoo

SINO	INGREDIENTS	F1(g)	F2(g)	F3(g)	F4(g)	F5(g)	F6(g)
1	Clitoria ternata			20			
2	Plectranthus barbatus						20
3	Emblia officinalis		20				
4	Camellia sinensis					20	
5	Nigella sativa				20		
6	Eclipta prostrata	20					
7	Morinda citrifolia	10					
8	Moringa oleifera		10				
9	Cyclea peltata			10			
10	Mussaenda frondosa				10		
11	Sida cordifolia					10	
12	Hibiscus rosa sinensis						10
13	Lowsonia Inermis	10	10	10	10	10	10
14	Trigonella foenum – graecum	10	10	10	10	10	10
15	Acacia concinna	10	10	10	10	10	10
16	Bacopa Monnieri	10	10	10	10	10	10
17	Sapindus Mukorossi	10	10	10	10	10	10
18	Aloe Barbadensis	10	10	10	10	10	10
19	Xanthomonas campestris	10	10	10	10	10	10

PROCEDURE

The multipurpose poly herbal powder shampoo was prepared by simple mixing process. Firstly all the plant materials were collected and dried under shade. After that the materials were size reduced and then sieved using sieve no.120 and weighed the required amount of powdered materials essential for the formulation. All the ingredients are then mixed well and they were finally packed in a suitable container for evaluation.

EVALUATION

Evaluation of shampoo

A. organoleptic evaluation

The developed poly herbal powder shampoo were evaluated for their organoleptic characters like colour, odour, texture.

B. Physico-chemical evaluation

1. pH

The formulated shampoo were diluted by using distilled water to produce a shampoo of 10%v/v concentration. The pH of the prepared shampoo was determined by using pH paper.

2. Dirt dispersion

Two drops of shampoo were added to a large test tube containing 10ml of distilled water. To this solution, one drop of India ink was added and the test tube was stoppered and shaken 10 times. The



amount of ink in the foam was indicated as none, light, moderate or heavy.

3. Foaming ability and Foam stability

50ml of 1% shampoo solution was put into 250ml graduated cylinder and covered the cylinder with hand and shaken for 10 times. The total volume of the foam contents after 1 minute shaking was recorded. The foam volume was calculated after shaking the volume of the foam at 1 minute interval for 4 minutes were recorded.

4. Cleaning action

5g of wool yarn were placed in grease, after that it was placed in 200 ml of water containing of shampoo in a flask. Temperature was maintained at 35° celsius. The flask was shaken for 4 minutes at the rate of 50 times a minute. The solution was removed and sample was taken out, dried and weighed and calculated the amount of grease removed.

5. Determination of percentage solid content

A china dish was cleaned, dried and weighed. To this, an accurately weighed amount of formulated shampoo(4g) was added and the dish with shampoo was weighted. The china dish with shampoo was placed on a hot plate and heated until the liquid portion was evaporated. The weight of the solid contents of shampoo after complete drying was calculated.

6. Stability study

The optimized formulation was subjected to stability studies in accordance with ICH guidelines for accelerated testing with required modification. The sample from each formulation was taken and kept at room temperature for the duration of one month.

7. Ash value

Total ash: About 2g of the powdered drug were accurately weighed and it is transferred to silica crucible which were previously weighed. It is then heated at a temperature in a muffle furnace until it is carbon free. The silica crucibles were taken out from the muffle furnace and placed in a desiccator.

It is then weighed and percentage of total ash with reference to the air dried drug.

$$\% \text{Total ash} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

8. Extractive value

a. Water soluble extractive value

Accurately weighed about 5g of air dried powdered plant material were taken in 100ml chloroform water in a closed flask for 24 hours. During the first 6 hours it was shaken and filtered. 25ml of the filtrate were evaporated to dryness in a flat bottomed petridish and dried 105°C and weighed. Then the percentage water soluble extractive values were calculated with reference to the air dried drugs.

b. Alcohol soluble extractive value

Accurately weighed about 5g of air dried powdered plant material were taken in closed flask and 100ml of 95% ethanol was added into it. During the first 6 hours it was shaken frequently and filtered 25ml of the filtrate were evaporated to dryness in a flat bottomed petridish and dried at 105°C and weighed. Then the percentage ethanol soluble extractive values were calculated with reference to the air dried drugs.

9. Wetting time

The canvas was cut into 1 inch diameter discs having an average weight of 0.44g. The disc was floated on the surface of shampoo solution of 1%w/v and the stopwatch started. The time required for the disc to begin to sink was measured accurately and noted as the wetting time.

C. General powder characteristics

1. Angle of repose

The material is poured through a funnel to form a cone. The tip of the funnel should be held close to the growing cone and slowly raised as the pile grows, to minimize the impact of falling particles. Stop pouring the material when the pile reaches a predetermined height or the base a predetermined width.

2. Bulk density



The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the interparticulate void volume.

2. Tapped density

The tapped density is obtained by mechanically tapping a graduated measuring cylinder or vessel containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped, and volume or mass readings are taken until little further volume or mass change is observed.

D. Invitro antidandruff activity evaluation (Agar well diffusion method)

- Preparation of pre-inoculum: Take the loopful of culture of fungus aseptically and transfer to sterilized and cooled 25ml sabouraud dextrose(broth) and mix well. Incubate the broth 25°C for 24hrs.
- Preparation of pour plates: A sabouraud dextrose agar(150ml) is autoclaved and poured to the already autoclaved plate and cooled to room temperature and allowed to solidify. The culture was spread on the agar surface aseptically by using sterilized cotton.
- Making wells on agar plates: Wells of 6mm in diameter were made aseptically on the agar plate by using a sterilized well digger. The shampoo samples(100ml) were aseptically added into the well by using a micropipette. The petriplates are kept in refrigerator (1hr) for the diffusion of substances from well into surrounding medium. During this time the growth of the organism is reduced. After 1hr, the plates were incubated in inverted condition at 37° c for 48hours.
- Measurement of the zone of inhibition: After 48hours, the plates were observed for the presence of inhibition of fungal growth and it was indicated in the form of a clear zone of inhibition around each well containing

different samples. The size of the inhibitory zone was measured in mm.

Evaluation of dye

A. organoleptic evaluation

The developed Multipurpose poly herbal powder shampoo were evaluated for their organoleptic characters like colour, odour, texture.

B. Physico-chemical evaluation

1. pH

The formulated shampoo where diluted by using distilled water to produce a shampoo of 10%v/v concentration. The pH of the prepared shampoo was determined by using pH paper.

2. Loss on drying

Loss on drying is the loss of mass expressed in present m/m. Two gram of the powder was weighed accurately and transferred into a dry petri dish. The petridish is placed in a dessicator for 2 days over calcium chloride crystals. Then the powder was taken and weighed accurately to find out the weight loss during drying.

3.Ash value

Total ash: About 2g of the powdered drug were accurately weighed and it is transferred to silica crucible which were previously weighed. It is then heated at a temperature in a muffle furnace until it is carbon free. The silica crucibles were taken out from the muffle furnace and placed in a desiccator. It is then weighed and percentage of total ash with reference to the air dried drug.

C. Stability study

The optimized formulation was subjected to stability studies in accordance with ICH guidelines for accelerated testing with required modification. The sample from each formulation was taken and kept at room temperature for the duration of one month.

D. Phytochemical evaluation

1. Molisch's test

Add the test sample to the test tube containing water and shake it to dissolve. Add, 2 to 3 drops of the Molisch reagent. Add concentrated sulphuric



acid in drops along the sides of the test tube slowly. The formation of a purple ring indicates the presence of carbohydrates.

2.Fehling's test

Add the sample in a dry test tube. Distilled water should be kept in another tube as control. Fehling's solution is to be added in the tubes. The tubes must be kept in water bath. Make observations and record if there is any development of red precipitate.

3.Hager's test

Two milliliters of extract were treated with few drops of Hager's reagent. A yellow precipitate was formed, indicating the presence of alkaloids.

4.Volatile oil test

The powder on treatment with alcoholic solution of Sudan III develops red colour in the presence of volatile oils.

E. Rheological evaluation

1.Bulk density

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the interparticulate void volume.

2. Tapped density

The tapped density is obtained by mechanically tapping a graduated measuring cylinder or vessel containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped, and volume or mass readings are taken until little further volume or mass change is observed.

3.Angle of repose

The material is poured through a funnel to form a cone. The tip of the funnel should be held close to the growing cone and slowly raised as the pile grows, to minimize the impact of falling particles. Stop pouring the material when the pile reaches a predetermined height or the base a predetermined width.

4.Hausner's ratio

Hausner's ratios ($HR = \rho_{TAP}/\rho_{BULK}$, where, ρ_{TAP} is the tapped density of the powder and ρ_{BULK} is the bulk density of the powder) and particle size distribution can be used to measure the flow properties and the size distribution of the particles, respectively.

F.Invito staining studies

An invitro staining study of an herbal formulation would involve evaluating the dye's ability to stain hair strands. The main steps include:

- Sample preparation: Obtain a sample of the formulation and ensure it is standardized and well mixed. It's important to use a consistent and representative sample throughout the study.
- Hair strand preparation: Obtain hair samples that are similar in colour, texture, and length. Cut the hair strands into equal lengths to ensure uniformity. If desired, pretreat the hair strands with a standard conditioner to simulate real-world conditions.
- Application of the powder shampoo: Apply the formulation to the hair strands using a standardized method, such as immersion or brushing. Ensure that the dye is applied uniformly across hair strands.
- Assesment of staining: The white hair strands were turns into black by the application of the formulation.

RESULTS AND DISCUSSION

Authentication of collected plant materials

The collected plant materials were identified and authenticated by Dr. Delse P Sebastian M.Sc., Ph.D. Assistant Professor of Botany, St. JOSEPH'S COLLEGE (AUTONOMOUS), DEVAGIRI CALICUT.

Physicochemical parameters

After the collection of plant materials, they were shade dried and powdered coarsely in an electronic blender and stored in air tight containers until further use. Physicochemical parameters of the



plants such as ash value, extractive values are tabulated below:

Physicochemical parameter of *Morinda citrifolia*, *Eclipta prostate*, *Phyllanthus embilica*, *Lawsonia inermis*, *Cyclea peltate*, *Clitoria ternatea*

Test	Morinda citrifolia	Eclipta prostate	Phyllanthus embilica	Lawsonia inermis	Cyclea peltata	Clitoria ternatea
Total ash (%W/W)	10 %w/w	8 %w/w	6 %w/w	10 %w/w	9 %w/w	9 %w/w
Acid insoluble ash (%W/W)	8 %w/w	6 %w/w	5 %w/w	9 %w/w	6 %w/w	7 %w/w
Water soluble ash (%W/W)	9 %w/w	10 %w/w	8 %w/w	7 %w/w	8 %w/w	9 %w/w
Water soluble extractive value(%W/W)	15 %w/w	13 %w/w	10 %w/w	11 %w/w	12 %w/w	11 %w/w
Alcohol soluble extractive value (%W/W)	14 %w/w	12 %w/w	11 %w/w	10 %w/w	11 %w/w	10 %w/w

Physicochemical parameters of *Mussaenda cordifolia*, *Camelia sinensis* and *Plectranthus frondosa*, *Nigella sativa*, *Senegalia rugata*, *Sida barbatus*

Test	Mussaenda frondosa	Nigella sativa	Senegalia rugata	Sida cordifolia	Camelia sinensis	Plectranthus barbatus
Total ash (%W/W)	9%w/w	8%w/w	8%w/w	7%w/w	6%w/w	7%w/w
Acid insoluble ash (%W/W)	7%w/w	6%w/w	7%w/w	5%w/w	4%w/w	5%w/w
Water soluble ash (%W/W)	8%w/w	7%w/w	6%w/w	6%w/w	5%w/w	6%w/w
Water soluble extractive value(%W/W)	14%w/w	12%w/w	13%w/w	11%w/w	10%w/w	11%w/w
Alcohol soluble extractive value (%W/W)	12%w/w	10%w/w	12%w/w	10%w/w	9%w/w	11%w/w

Physicochemical parameters of *Hibiscus rosa graecum*, *Sapindus mukorossi* and *Bacopa sinensis*, *Aloe barbadensis*, *Trigonella foenum monnieri*

Test	Hibiscus rosa sinensis	Aloe barbadensis	Trigonella foenum graecum	Sapindus mukorossi	Bacopa monnieri	Acacia concina
Total ash (%W/W)	6%w/w	5%w/w	7%w/w	7%w/w	8%w/w	6%w/w
Acid insoluble ash (%W/W)	8%w/w	7%w/w	9%w/w	8%w/w	9%w/w	9%w/w
Water soluble ash (%W/W)	9%w/w	8%w/w	6%w/w	5%w/w	6%w/w	8%w/w
Water soluble extractive value(%W/W)	15%w/w	16%w/w	14%w/w	13%w/w	15%w/w	14%w/w

Alcohol soluble extractive value (%W/W)	13%w/w	15%w/w	14%w/w	10%w/w	11%w/w	10%w/w
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EVALUATION

1 Organoleptic evaluation

EVALUATION OF ANTIDANDRUFF SHAMPOO

SI NO	PARAMETER	F1	F2	F3	F4	F5	F6
1	Colour	Greenish brown	Faint brownish	Grayish brown	Golden brown	Greenish brown	Brownish yellow
2	Odour	Characteristic	Slight	Slight	Characteristic	Characteristic	Slight
3	Texture	Fine	Fine	Fine	Fine	Fine	Fine

Organoleptic evaluation of the formulated powder shampoo were carried out such as colour, odour

and texture for all the six formulations and the results was found to be satisfactory.

2 General powder characteristics

SL NO	PARAMETER	F1	F2	F3	F4	F5	F6
1	Angle of repose	19.11°	26.46°	25.73°	30.41°	32.43°	27.66°
2	Bulk density	0.50 g/ml	0.43 g/ml	0.46 g/ml	0.40 g/ml	0.43 g/ml	0.53 g/ml
3	Tapped density	0.12 g/ml	0.13 g/ml	0.14 g/ml	0.16 g/ml	0.11 g/ml	0.12 g/ml
4	Hausner's ratio	1.10	1.15	1.17	1.2	1.19	1.16

General powder characteristics of all the six formulations were carried out and among that the formulation 1 has excellent flow properties

whereas formulations 2, 3 and 6 have good flow and formulation 4 and 5 have moderate flow.

3. Physicochemical properties

SL NO	PARAMETER	F1	F2	F3	F4	F5	F6
1	pH	4.7	5.9	5.1	7	6.9	6.5
2	Dirt dispersion	Good	None	Light	Light	Moderate	None
3	Wetting time	105sec	140sec	115sec	125sec	150sec	162sec
4	Foaming ability	Good	Poor	Moderate	Moderate	Poor	Moderate
5	Ash value	4.88%w/w	4.21%w/w	5.11%w/w	4.45%w/w	4.92%w/w	5.22%w/w
6	Extractive value	18%w/w	14%w/w	12%w/w	17%w/w	19%w/w	15%w/w
7	Stability study	Stable	Stable	Stable	Stable	Stable	Stable
8	Percentage solid content	99.81%	99.62%	99.32%	99.71%	99.55%	99.69%

Various physicochemical parameters of all the six formulations were carried out such as pH ,dirt dispersion, wetting time, foaming ability, ash value, extractive value and percentage solid content. Stability studies of all these formulations

were also carried out to check the stability of the products at various temperature conditions and all of them were found to be stable.

Invitro antidandruff evaluation

SL NO	PARAMETER	F1(mm)	F2(mm)	F3(mm)	F4(mm)	F5(mm)	F6(mm)
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1	Zone of inhibition	12mm	10mm	9mm	11mm	9mm	11mm
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Invitro antidandruff evaluation were carried out using agar well diffusion method for all the six formulations and among that the formulation 1

shows best antidandruff activity in which the zone of inhibition is 12mm.

EVALUATION OF HAIR DYE

Phytochemical evaluation

SL NO	TEST	F1	F2	F3	F4	F5	F6
1	Molisch's test	+	+	+	+	+	+
2	Mayer's test	+	+	+	+	+	+
3	Fehling's test	+	+	+	+	+	+

Phytochemical evaluation of all the six formulations were carried out such as Molisch's test, mayer's test and fehling's test to determine the presence of sugars, carbohydrates and

alkaloids. The results obtained shows that all the six formulations contains sugars, carbohydrates and alkaloids.

Stability study

SL NO	AFTER 1 MONTH	F1	F2	F3	F4	F5	F6
1	Colour	No change	No change	No change	No change	No change	No change
2	Odour	No change	No change	No change	No change	No change	No change
3	Texture	No change	No change	No change	No change	No change	No change

The stability studies were carried out for the all the six formulated products and it is noticed that even after a month there is no any change in colour, odour and texture in any of the formulations. This shows that the products are stable.

Invitro staining study

Invitro staining studies were carried out for all the six formulated products by applying them over white hair strands and from this the formulation 1 shows better hair dye action.

CONCLUSION

The ultimate aim of the present work was to formulate multipurpose polyherbal powder shampoo with antidandruff as well as hair colouring activity. Dandruff is a common condition that causes the skin on the scalp to flake. It is caused by Malassezia yeasts and it affect almost half of the population throughout the world. As a consequence of the use of chemical products an endeavour was made to formulate polyherbal multipurpose powder shampoo which is effective in terms of safety and control the greying and

dandruff condition which helps to reduce the adverse effects and toxicity of the chemical drugs. All the plant materials needed for the formulation were collected from different areas. We have formulated a total of six formulations and the collected plant materials were dried under shade drying before grinding. All these plant materials were also evaluated and then the dried plant materials were grinded thoroughly to form fine powders. After that the powdered materials were passed through sieve no. 120 to make the powder more fine. The physicochemical parameters like ash vale, extractive vale of the powdered plant material were carried out. The formulations were prepared by simple mixing process of different amount of the plant materials. After formulating, they were evaluated. Evaluation tests such as organoleptic evaluation, physicochemical parameters, rheological properties, invitro staining studies, in vitro antidandruff activity were carried out for all the six formulated products and compared the actions among them. After carrying out all these evaluations it was found to be that the



formulation 1 shows better antidandruff as well as hair dye action among the other 5 formulations. We have also carried out stability studies for all these six formulated products to check the stability of the products at different temperatures and it was noticed that all these formulations were stable even after a period of one month. However in the present work, herbal formulations reported to have more significant advantages over synthetic formulations. Hence we concluded that the formulated multipurpose polyherbal powder shampoo offers a natural, safe, effective option for antidandruff action as well as for colouring the hair.

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