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Original Research Article

Formulation and evaluation of dry herbal powder shampoo

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ABSTRACT

Background: Shampoos are used not only for cleansing purpose but also for imparting gloss to hair and to maintain their manageability and oiliness for hair. Shampoos are of various types, like powder shampoo, clear liquid shampoo liquid shampoo, lotion shampoo, solid gel shampoo, medicated shampoo, liquid herbal shampoo etc. As far as herbal shampoos are concerned in stability criteria. Depending upon the nature of the ingredients they may be simple or plain shampoo, antiseptic or antidandruff.
Materials and Methods: In the present work the herbal shampoo powder has been developed, by using traditional drugs for hair care. The preparation were formulated using Onion Powder, Rose Petal, Lemon Grass, Flaxseed or Linseed, Hirda, Bahera, Black tea, Brahmni, Triphala, Bhringraj, Ginger Root, Ashwagadha, Shikakai, Feenu greek, Shatavari, Heena, Wala, Aloevera Powder, Nirgudi Powder, Bavachi, Jatha mansi, Tulsi, Neem, Hibiscus Flower, and Retha evaluated for organoleptic properties, powder characteristics, foam test and physical evaluation.
Result and Conclusion: The physicochemical evaluation of the formulated shampoo showed ideal results. However, to improve its quality, product performance, and safety, further development and study was required.

1. Introduction

Hairs are the integral part of human beauty. People are using herbs for cleaning, beautifying and managing hair since the ancient era. Whereas the hair has been trimmed, shaped and even colored since the most ancient times, relatively little emphasis has been placed on the process of cleaning it.[1,2] Only in this century has a real technology in the cleaning of the hair and scalp been developed. First came the mass distribution of cake soap and sanitary facilities to make bodily cleanliness and personal hygiene practice. Next came the specialization of branded shampoo products for the hair and scalp, offered in multiplicity of types and forms.[3–5] Now, washing the hair and scalp with shampoo has become a nearly universal practice. Shampoos are probably the most widely used hair products today, based on synthetic ingredients as well as herbal ingredients. Shampoos are of various types, like powder shampoo, clear liquid shampoo liquid shampoo, lotion shampoo, solid gel shampoo, medicated shampoo, liquid herbal shampoo etc.[6] Dandruff is known to be controlled

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by fungi static ingredients in Anti-dandruff shampoos. Herbal formulation have growing demand in the world market. The natural remedies are more acceptable in market because it's safe and fewer side effect antidandruff shampoo and nutritional shampoo containing vitamin, amino acids proteins hydrolysate.[7] Currently available treatment of dandruff include therapeutic use of zinc pyrithione, salicylic acid, imidazole derivatives, glycolic acid, steroids, and sulphur and coal tar derivatives. However, these agents show certain limitations, either due to poor clinical efficacy or due to the. Furthermore compliance issues, these drugs are unable to prevent recurrence.[8] The synthetic shampoo contains cationic, anionic and non anionic surfactant mix in this surfactant having good foaming character but its toxic and caused irritation of eye. Hard water the surfactants leave a deposit of sodium, calcium and magnesium salts on the hair shaft. So, these synthetic shampoos are found to have side effects like drying effect on the hair. These shampoos leave the hair too dry to handle (or) comb, to avoid these problems, herbal shampoos will be useful.[8,9]

The herbal shampoo powder was formulated using natural ingredients with Onion Powder, Rose Petal, Lemon Grass, Flaxseed or Linseed, Hirda, Bahera, Black tea, Brahmni, Triphala, Bhringraj, Ginger Root, Ashwagadha, Shikakai, Feenu greek, Shatavari, Heena, Wala, Aloevera Powder, Nirgudi Powder, Bavachi, Jatha mansi, Tulsi, Neem, Hibiscus Flower, and Retha.

2. Materials and Methods

2.1. Material

All the herbal drugs were procured from local market. The herbal shampoo powder was formulated using following natural ingredients, which are tabulated in Table 1.

2.2. Experimental

2.2.1. Formulation of herbal shampoo

All the plant material were dried and grinded. All the required herbal powders for shampoo preparation were weighed individually. The crude ingredients were collected and these ingredients were size reduced using hand driven mixer individually. All these fine ingredients were mixed thoroughly by mixer to form a homogenous fine powder. Then this fine powder was passed through sieve no :80, to get the sufficient quantity of fine powder. Then it was packed and labeled suitably.[10,11]

2.2.2. Evaluation of herbal shampoo powder[11–15]

Prepared formulations of shampoos were subjected to following evaluation parameters.

2.2.2.1. Organoleptic evaluation. Organoleptic evaluation on the parameters like colour, odour taste and texture was carried out. Colour and texture was evaluated by vision and touch sensation respectively. For taste and odour evaluation a team of five taste and odour sensitive persons was formed and random sampling was performed.

2.2.2.2. General powder characteristic. General powder characteristics includes evaluation of those parameters which are going to affect the external prop0erties (like flow properties, appearance, packaging criteria etc.) of the preparation, Characteristics evaluated under this section are powder form, particle size angle of repose and bulk density. Sample for all these evaluations were taken at three different level i.e. from top, middle and lower level.

2.2.2.3. Particle size. Particle size is a parameter, which could affect various properties like spreadability, grittiness etc., particle size was determined by sieving method by using I.P. Standard sieves by mechanical shaking for 10 Min.

2.2.2.4. Angle of repose. It is defined as the maximum angle possible in between the surface of pile of powder to the horizontal flow.

Funnel method

Required quality of dried powder is taken in a funnel placed at a height of 6 cm from a horizontal base. The powder was allowed to flow to form a heap over the paper on the horizontal plane. The height and radius of the powder was noted and recorded the angle of repose (θ) can be calculated by using the formula. Required amount of dried powder is placed in a cylindrical tube open at both ends is placed on a horizontal surface. Then the funnel should be raised to form a heap. The height and radius of the heap is noted and recorded. For the above two methods, the angle of repose (θ) can be calculated by using the formula.

$\theta = \tan -1(h / r)$

Where,

θ – Angle of repose, h – height of the heap,

r – Radius of the base

2.2.2.5. Bulk density. Bulk density is the ratio between the given mass of a powder and its bulk volume. Required amount of powder is dried and filled in a 50 ml measuring cylinder up to 50 ml mark. Then the cylinder is dropped onto hard wood surface form a height of 1 inch at 2 second interval. The volume of the powder is measured. Then powder is weighed. This is repeated to get average values. The bulk density is calculated by using the below given formula.

2.2.2.6. Tapped density. The tapped density is an increased bulk density attained after mechanical tapping a container containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped for 1 min and volume or mass reading are taken until little further volume or mass change was observed. It was expressed in gram per cubic centimeter

Table 1: Biological source and their uses of herbal ingredients:

Sr. No.	Ingredient	Biological source / Family	Uses
1	Onion powder	It is derived from the plant Allium ascalonicum(Alliaceae)	Antiallergic, Antimicrobial, Expectorant.
2	Rose petal	A rose is woodly perennial flowering plant of the genus Rosa (Rosaceace)	Fragrance, Ease your pain, Soothe and Nourish your pain
3	Lemon grass	Obtained from the fresh aerial parts of Cymbopogon flexosus (Poaceae)	Clean the kidney, liver ,pancreas, digestive tract, Pain killer.
4	Linseed or Flaxseed	Obtained from dried ripen seeds of Linum uslitatissimum (Linaceae)	Demulcent, Poultice.
5	Hirda(Myrobalan)	Dried ripe fruits of Terminalia chebula (Combretaceae)	Hair Growth Promotor
6	Bahera	Dried ripe fruits Terminalia balerica (Combretaceae)	Provides nutrition To growing hair
7	Amla	Dried ripe fruits of Embelica officinalis (Euphorbiaceae)	Hair growth promoter
8	Neem	Dried leaves of Azadirachta indica (Miliaceae)	Antiseptic, antibacterial
9	Tulsi	Dried leaves of Ocimum santum (Labiateal)	Antibacterial
10	Shikakai	Dried seeds of Acacia rugate (Leguminesue)	Foam base
11	Henna	Dried leaves of Lawsonia inermis (Lythraceae)	Conditioner
12	Brahmi	Dried leaves of Centlla asiatica (Umbelliferae)	Support Health of Hair
13	Reetha	Dried fruits of Sapindus mukorossi (Sapindaceae)	Foaming agent.
14	Aloe vera powder	Dried leaves of Aloe barbadensis miller (Asphodelaceae)	Condition and moisturizing effect .
15	Methi powder or Fennu greeak	Dried seeds of Trigonella foenum-graecum(Leguminosae)	Conditioning and nourishment of hair.
16	Ashwagandha	Ashwagandha (Withania somnifera) is a short woody shrub belonging to the Solanaceae family.	Controls Hair Fall, Prevents Premature Greying, Promotes Hair Health.
17	Black tea	It is obtained from Camellia sinensis (Theacea)	Decreases shedding.
18	Bhringraj	It is obtained from Entire herb Ecilipta-alba(Asteraceae)	Increasing haemoglobin level, Reduces kapha.
19	Jathamansi	It consist of dried rhizomes of Nardostachys jathmansi(Valerianaceae).	Sedative, diuretic, anti-spasmodic
20	Ginger root	It obtained from Zingiber officinale(Zingiberaxeae)	Aromatic, carminative, flavouring agent.
21	Shatavari	It consists of dried roots & leaves of plant Asparagus racemosus (Liliaceae)	Kindey stone, Blood Glucose Regulation, Smooth Menstruction.
22	Wala	It is obtained from Vetiveria zizanoides (Votiver / Khas-khas grass)	Diuretic, Stimulant and Tonic
23	Bavchi	Thse are the dried ripe fruits of the plant known as Psoralea corylifolia Linn.(Leguminosae)	Inflammatory diseases of the skin, treatment of leucoderma,leprosy.
24	Nirgundi powder	It is obtained from Vitex negundo Linn.(Verbenaceae)	Analgesic & Anti-inflammatory, Helps in Digestion, Treating skin diseases
25	Hibiscus flower	It is contain fresh flowers & leaves of Hibiscus rosa-sinensis(Malvaceae)	Hibiscus flower are used for conditions such as high blood pressure, high cholesterol, hair regrowth.

Table 2: Formula for herbal dry powder shampoo

Sr.No.	Ingredient	Quantity (for 150gm)
1	Onion powder	5gm
2	Rose petal	4gm
3	Lemon grass	2.5gm
4	Linseed or Flaxseed	5gm
5	Harda (Myrobalan)	3.3gm
6	Bahera	3.3gm
7	Amla	3.3gm
8	Neem	5gm
9	Tulsi	10gm
10	Shikakai	10gm
11	Henna	5gm
12	Brahmi	10gm
13	Reetha	10gm
14	Aloe vera powder	10gm
15	Methi powder or Fenugreek	7gm
16	Ashwagandha	5gm
17	Black tea	5gm
18	Bhringraj	5gm
19	Jathamansi	5gm
20	Ginger root	1gm
21	Shatavari	5gm
22	Wala	5gm
23	Bavchi	5gm
24	Nirgundi powder	2gm
25	Hibiscus flower	15gm

(g/cm3)

2.2.2.7. Compressibility / Carr's Index. This is calculated using the formula;

Bulk density (Tapped) – Bulk density (Untapped)

$$Carr's\ index = \frac{Bulk\ density\ (Tapped) - Bulk\ density\ (Untapped)}{Bulk\ density\ (Tapped)} \times 100$$

Bulk density (Tapped)

2.2.2.8. Hausner's Ratio. The formula used to determine Hausner's ratio we use bulk density and tap density ratio. For the determination of Hausner' ratio follow:

Bulk density (Tapped)

$$Hausner's\ Ratio = \frac{Bulk\ density\ (Tapped)}{Bulk\ density\ (Untapped)}$$

Bulk density (Untapped)Moisture content

Moisture content in the formulation is very important as it contains herbs which are liable to be attacked by weather. 2gm of powder was taken and kept in an oven and dried up to two constant reading and % moisture content was calculates as w/w.

2.3. Physicochemical evaluation

1. *pH* **:** pH affect the pharmaceutical consideration as well as it affect the effect of shampoo on hairs.1gm of powder shampoo was taken and 9ml of distilled water was added to it. pH of the resulting solution was calculated using pH meter at 37^0c.
2. *Washability:* Formulations were applied on the skin and then ease and extent of washing with water were checked manually.
3. *Solubility:* Solubility is defined as the ability of the substance to soluble in a solvent. One gram of the powder is weighed accurately and transferred into a beaker containing 100 ml of water. This was shaken well and warmed to increase the solubility. Then cooled and filter it, the residue obtained is weighed and noted.
4. *Skin irritation test:* The skin irritation tests revealed that the herbal shampoo powder shows no harmful effect on skin. This is due to the absence of synthetic surfactants. Most of the synthetic surfactants produce inflammation of the eyelid and corneal irritation. But in this formulation of herbal shampoo powder, the uses of all ingredients are obtained naturally. So it does not produce any harmful effect on skin.
5. *Ash value:* Total ash content Ash value is calculated to determine the inorganic contents which is characteristic for a herb. About 2gm of powder drug was taken in silicon dish previously ignited and weighed. Temperature was increased by gradually increasing the heat not exceeding to red colour. After complete burning, ash is cooled and weighed.
6. *Acid insoluble ash* Acid insoluble ash was calculated by boiling above obtained ash with 25 ml dil. Hcl for 5

Table 4: General powder characteristics.

Sr. No.	Test	Result
1.	Particle Size	20-23nm
2.	Angle of Repose	$45^0 6$"
3.	Bulk Density	0.370 g/cm^3
4.	Tapped Density	0.526 g/cm3
5.	Compressibility / Carr's Index	27.42
6.	Hausner's Ratio	1.37
7.	Moisture Content	4%

Table 5: Physicochemical evaluation

Sr. No.	Test	Result
1.	pH	5
2.	Washability	Easily washable
3.	Solubility	Insoluble in water
4.	Skin irritation test	No harmful effect on skin
5.	Ash Value a. Acid insoluble b. Total ash count	0.21% w/w 5.5% w/w 10.5% w/w
6.	Stability Study	Stable
7.	Moisture content	1.82% w/w
8.	Nature of hair after washes	Soft manageable
9.	% Foaming capacity	151.5

min, insolublematter was collected in gooch crucible, washed with hot water, ignited and weighed

7. *Stability Study:* Stability and acceptability of organoleptic properties (odour and colour) of formulations during the storage period indicated that they are chemically and physically stable.
8. *Nature of hair after washes:* Nature of hair after wash can be done by collecting the responses of volunteers.
9. *Foaming ability and foam stability:* Cylinder shake method with slight modification was used for determining foaming ability. 50ml of the 1% shampoo solution was put into a 100 ml measuring cylinder and covered with hand. Measuring cylinder was shaken for 1 minute. The total volume of the foam contents after 1 minute shaking was recorded. The procedure was continued for 5 minutes.

3. Result and Discussion

Herbal powder shampoo was prepared using Onion Powder, Rose Petal, Lemon Grass, Flaxseed or Linseed, Black tea, Brahmni, Triphala, Bhringraj, Ginger Root, Ashwagadha, Shikakai, Feenu greek, Shatavari, Heena, Wala, Aloevera Powder, Nirgudi Powder, Bavachi, Jatha mansi, Tulsi, Neem, Hibiscus Flower and Retha in different compostion. (Tables 1 and 2) These formulations were prepared using mixing in ascending order by weight and with continuous trituration. This preparation was evaluated organoleptically observing colour, odour, taste and texture. Results shows a faint brown colour (Table 3). General powder characteristics of formulation was done and shown in (Table 4). The ash values in (% w/w) was calculated. The Moisture content was found to be 1.82% w/w. The pH was found to be 5 (Table 5).

Table 3: Organoleptic evaluation/visual appearance:

Sr. No.	Test	Observation
1	Colour	Faint Brown
2	Odour	Characteristic
3	Texture	Fine and Smooth
4	Taste	Slight

4. Conclusion

Medicinal plants used in the formulation of herbal shampoo were found as rich source of novel drugs. These plants are Onion Powder, Rose Petal, Lemon Grass, Flaxseed or Linseed, Hirda, Bahera, Black tea, Brahmni, Triphala, Bhringraj, Ginger Root, Ashwagadha, Shikakai, Feenu greek, Shatavari, Heena, Wala, Aloevera Powder, Nirgudi Powder, Bavachi, Jatha mansi, Tulsi, Neem, Hibiscus Flower, and Retha has been reported for hair growth and conditioning. The various quality control parameters were checked. All parameter gives favorable result. The result obtained on present study shows that the active ingredients of these drugs when incorporated in shampoo gives more stable products with good aesthetic appeal. The pH of the shampoo has been shown to be important for improving and enhancing the qualities of hair, minimizing the irritation to the eyes and stabilizing the ecological balance of the scalp. The current trend to promote shampoos of lower pH is one of the minimizing damages to the hair. Such results are estimated out of a formulation to establish strong results for the usage and good results of the product. Though the product is in dry form inspite has wonderful wetting capacity and being dry is very good for the storage. The evaluation parameters like Organoleptic evaluation, General powder Characters, Physicochemical Evaluation, Cleaning action, foaming, wetting agent, Nature of hair after wash was carried out and was found to be within the standard range.

5. Source of Funding

None.

6. Conflict of Interest

None.

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