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Formulation and Evaluation of Hair care poly herbal Powder Shampoo

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ABSTRACT: Background: Day by day dependency of people is rising on herbal or Ayurvedic formulation not only for chronic ailments but also for number of acute problems. **Aim:** The study was aimed for Formulation and evaluation of hair care poly herbal powder shampoo. **Methods:** This herbal shampoo was formulated using natural ingredients, with proven efficacy of hair care preparation. The combination of several such ingredients of herbal origin has made it possible to secure highly effective dry powder shampoo. The formulation at laboratory scale was done and evaluated for number of parameters like organoleptic properties, particle size, flow property, pH, physical properties, cleaning efficiency, wetting time, foaming tendency, solid content and stability, to ensure its safety and efficacy. **Results:** The prepared herbal shampoo powder formulation was well comparable to the market shampoos in many parameters. The flow property of powder was good with pH value within the skin pH range. The powder shampoo was found to be non irritant to skin with excellent foaming tendency. The cleaning action and wetting time of shampoo was found to be 30.11 % and 48 s. The shampoo was found to be stable with good physical properties. Our data suggests that, prepared herbal shampoo powder could be recommended as a choice product in cost effective hair care cosmetics. **Conclusion:** Hence we concluded that the formulation of polyhedral shampoo powder is effective in reducing dandruff without irritation, less adverse effect and better conditioning effect.

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INTRODUCTIONS:

The Shampoo as a preparation of a surfactant i.e. surface active material in a suitable form liquid, solid, powder. The usage of surface active material as ingredient may be harmful for human being, as well as for environment. Herbal cosmetics and the tremendous range of herbal products now generally available to the public. Herbal shampoos are the cosmetic preparations that with the use of traditional Ayurvedic herbs are meant for cleansing the hair and scalp just like the regular shampoo. They

are used for removal of oils, dandruff, dirt, environmental pollutions and many more. There are many ingredients found in organic shampoos that are also found in natural shampoos which allow synergetic action because this formulation is polyherbal preparation. Natural Shampoos stimulate the growth of new hair by having a combination of organic and natural ingredients which stimulate the hair follicles while keeping the environment around the follicles clear and balanced [1,2].

MATERIALS AND METHODS:

All chemicals used in this study were of analytical grades and procured from an authorized dealer. The instruments, apparatus and machines used in this study were of GMP grade and procured from an authenticate suppliers.

Collection of Plant Materials:

The different parts of the plants were selected for the study having hair care property, the plants are Amla fruit (*Embelica officinalis*), Hibiscus Leaf (*Hibisucus rosea*), Neem leaf (*Azadirachta indica*) Shikakai fruit (*Acacia concinna*), Aloe leaf (*Aloe barbadensis*), Henna Leaf (*Lawsonia inermis*), Brahmi root (*Centella asiatica*) and Rithafruit (*Sapindus mukorossi*), The powder of Amla fruit, Hibiscus Leaf, Neem leaf, Shikakai fruit, Aloe leaf, Henna Leaf and Ritha fruit were collected from the local market. The raw materials collected were given with their respective biological source uses and formula is given in Table 1.

Preparation of the Herbal Powder Shampoo:

All the required herbal powders for shampoo preparation were weighed individually by using digital balance (Entris® Analytical Balancee, Sartorius, India). The crude ingredients were collected and these ingredients were size reduced using hand driven mixer (Ferm PMM1006 Mixer, Mumbai) individually. All these fine ingredients were mixed thoroughly by mixer to form a homogenous fine powder. The mixture was sieved through sieve number 120 (Brass sieves 120 MM, ASTM Mesh, India). The herbal powder shampoo in fine form was stored in plastic container for further study [3].

Evaluations of Herbal Powder Shampoo:

***Organoleptic evaluation*:**

The herbal powder shampoo was evaluated for organoleptic parameters like color, odor, taste and texture. Color and texture was evaluated by visualization method and touch sensation respectively. For taste and odor evaluation, a team of five taste and odor sensitive persons were selected [4].

General powder characteristics:

General powder characteristics includes evaluation of those parameters which are going to affect the external properties (Flow properties, appearance, packaging criteria etc.) of the preparation, Characteristics evaluated under this section are particle size, angle of repose, bulk density and tapped density. The two shampoo powders took at two different level i.e. from top, and lower level for the evaluation [3,4].

***Particle size*:**

Particle size is a parameter, which affect various properties like spreadability, grittiness and permeation. The particle size was determined by sieving method by using I.P. Standard sieves (Brass sieves 120 MM, ASTM Mesh, India) by mechanical shaking for 10 min.

***Angle of repose*:**

It is defined as the maximum angle possible in between the surface of pile of powder to the horizontal flow. The angle of repose was determined by using falling funnel method. Required quality of dried powder was 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 (h) and radius (r) of the powder was noted and recorded. The angle of repose (θ) can be calculated by using the formula. $\theta = Tan^{-1}(h/r)$ …..(1)

***Bulk density*:**

The bulk density of powder was determined by using Digital bulk density apparatus (Veego Instruments Corp., Mumbai). Bulk Density is the ratio between the given mass of a powder and its bulk volume. Required amount of the powder was dried and filled in a 50 ml measuring cylinder up to 50 ml mark. Then the cylinder is dropped onto a hard wood surface from a height of 1 inch at 2 s intervals. The volume (Bulk volume, v) of the powder is measured. Then the powder was weighed (W). This was repeated to get average values. The Bulk Density (ρ_v) was calculated by using the below given formula. $\rho_v = W/v$ ……. (2)

***Tapped density*:**

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample.

Fig 1. Herbs for Polyherbal powder Shampoo and Powders.

Table 1. Herbs and Botanical information used for Polyherbal Powder shampoo with formula.

Constituents	Biological source / Family	Uses	Quan-tity (%)
Amla Fruit	Dried ripe fruits of *Embellica Officinalis* (*Euphorbiacea*)	Darkening of hairs and hair growth promoter	15
Hibiscus leaf	Dried leaves of *Hibiscus rosea* (*Malvaceae*)	Prevents hair loss and growth promoter	15
Neem leaf	Dried leaves *Azadirachta indica* (*Miliaceae*)	Prevents the dryness of hairs and flaking of hairs	10
Shikakai fruit	Dried pods of *Acacia Concinna* (*Mimosaceae*)	Foam base and anti-dandruff	10
Aloe vera leaf	Dried leaves of *Aloe barbadensis* miller (*Asphodelaceae*)	Conditioner and moisturizing effect	5
Henna leaf	Dried leaves *Lawsonia inermis* (*Lythraceae*)	Growth of hair , conditioner	2
Brahmi root	Dried roots of *Centella asiatica* (*Apiaceae*)	Support to growth of hairs	5
Ritha fruit	Dried fruit of *Sapindus mukorossi* (*Sapindaceae*)	Detergent and antidandruff	10
Fenugreek powder	Dried leaves of *Trigonella foenum-graecum* (*Leguminosae*)	Conditioning and nourishment of hair	5
Tulsi	Dried leaves of *Osmium sanctun* (*Lamiaceae*)	Anti-bacterial	3
Lemon	Dried leaves of *Citrus limon* (*Rutaceae*)	Anti-dandruff,natural cleanser,ph modifier	10
Harda(myrobalan)	Dried ripes fruits of *Terminalia chebula* (*Combretaceae*)	Hair growth promoter	5
Indigofera	Dried leaves of *Indigofera Tinctoria* (*Fabiaceae*)		5

After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped for 1 min and volume or mass readings were taken until little further volume or mass change was observed. It was expressed in g/cm^3. The tapped density (ρ_t) was calculated by using the below given formula. $\rho_t = W/V$ ……. ….(3)

The Carr's Index (CI) and Hasuner ratio (HR) was determined by using following equations;

$CI (\%) = [(\rho_t - \rho_v)/\rho_t]\times100$ …(4)

$HR = \rho_t/\rho_v$ ….. ……...(5)

***pH*:**

The pH of 10 % shampoo solution in distilled water was determined at room temperature 25 °C. The pH was measured by using digital pH Meter (Mettler Toledo, India) [5].

***Washability*:**

Formulations were applied on the skin and then ease and extent of washing with water were checked manually [5].

***Solubility*:**

Solubility is defined as the ability of the substance to soluble in a solvent. One gram of the powder was weighed accurately and transferred into a beaker containing 100 ml of water. This was shaken well and warmed to increase the solubility. Then the solution was cooled and filtered. The residue obtained was weighed and noted [5].

***Loss on drying*:**

Loss on drying is the loss of mass expressed in percent m/m. About 2 g of the powder was weighed accurately and transferred into a dry petridish. The petridish was 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. The loss on drying (LOD) was calculated by using following formula [6].

$LOD (\%) = [(W_f-W_i)/W_i]\times100$ …..(6)

Where, W_i and W_f are initial and final weight of power before and after weighing.

***Skin /Eye irritation test*:**

The eye and skin irritation tests revealed that the herbal shampoo powder shows no harmful effect on skin and eye. 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 and eye [6].

***Dirt Dispersion*:**

Two drops of 1 % each shampoo powders were added in a large test tube. About 10 ml of distilled water was added to test tube. About 1 drop of India ink was added; the test tube was stoppered and shaked for 10 times. The amount of ink in the foam of was estimated as None, Light, Moderate, or Heavy [6].

***Moisture Content Determination*:**

About 10 g of each herbal shampoo powder was weighed in a tare evaporating dish and kept in hot air oven (Remi RDHO-50, Mumbai) at 105 °C. The drying process was repeated until the constant weight loss was observed after the interval of 30 min. The moisture content (MC) was calculated for each sample by using following equation [7].

$MC (\%) = [(W_f-W_i)/W_i]\times100$ …..(7)

Where, W_i and W_f are initial and final weight of power before and after weighing.

***Foaming Index/Ability*:**

About 1 g of the powder was weighed accurately and transferred into 250 ml conical flask containing 100 ml of boiling water. Then it is warmed gently for 30 min, cooled and filtered. The volume was made up the volume to 100 ml in standard volumetric flask. This extract was taken in 10 test tubes in a series of successive portion of 1, 2, 3….10 ml and remaining volume was made up with water up to 10 ml. Then the test tubes were shaken in longwise motion for 15 s at speed of 2 frequencies / second. Then the tubes were allowed to stand for 15 min. The height of the foam (a) was measured as foaming index (FI) [7].

$FI = 1000/ a$ …… (8)

***Cleaning action*:**

About 16.5 g of wool yarn were placed in grease, after that it was placed in 200 ml of water containing 1 g of each poly herbal shampoo powder in a flask. Temperature of water was maintained at 35 °C. The flask was shaken for 4 min at the rate of 50 times per minute. The solution was removed and sample was taken out, dried and weighed. The amount of grease removed was calculated by using the below equation [7].

$DP = 100(1-T/C)$ …… (9)

Where, DP is the % of detergency power, C and T are the weight of grease in the control and test sample in g.

***Foaming ability*:**
Although foam generation has little to do with the cleansing ability of shampoos, it is of paramount importance to the consumer and is therefore an important criterion in evaluating shampoos. Cylinder shake method was used for determining foaming ability. About 50 ml of the 1 % shampoo solution was put into a 250 ml graduated cylinder and covered the cylinder with hand and shaken for 10 times.
The total volumes of the foam contents after 1 min shaking were recorded. The foam volume was calculated only. Immediately after shaking the volume of foam at 1 min intervals for 4 min was recorded for all the three shampoo powders [8].

***Wetting time*:**
The canvas was cut into 1 inch diameter discs having an average weight of 0.44 g. 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 acutely and noted as the wetting time [8].

***Nature of hair after wash*:**
Nature of hair after wash can be done by collecting the responses of volunteers.

***Stability studies*:**
Stability and acceptability of organoleptic properties (Odour and color) of formulations during the storage period studies for few days at room temperature [8].

***Determination of percentage of solid contents*:**
A clean dry petriplate was weighed and to it 4 g of shampoo was added to the petriplate. The plate and shampoo were weighed. The exact weight of the shampoo was calculated only and the petriplate with shampoo was placed on the hot plate until the liquid portion was evaporated. The dry weight of the shampoo only (solids) after drying was calculated [8].

***Surface characterization*:**
Surface morphology of the hairs was examined by Scanning Electron Microscopy (SEM). The hair samples were mounted directly on the SEM sample stub, using double side stitching tape. The photomicrographs of suitable magnification were obtained for surface characterization.
The following hair samples were used for surface characterization: Sample 1.hair sample treated with shampoo 2. Hair sample treated with shampoo

***Ease of distribution*:**
Ease of distribution was performed by applying 5ml of the formulation over the wet hair and the time taken to complete the distribution was measured.

***Ease of rinsing*:**
The time taken to remove the detergent was performed by applying 5 ml of the shampoo and time taken for complete removal of frothing from wash water was determined.

***Ease of combing (wet)*:**
Ease of combing was performed by passing a comb through the wet hair and checking whether the comb glides smoothly.

***Speed of drying*:**
The speed of drying was performed by applying 5 ml of the shampoo in hair and dried after washing. The drying of hair was performed by using a table fan with constant speed and distance from the subject.

***Ease of combing (Dry)*:**
Ease of combing was performed by passing a comb through the dry hair and checking whether the comb glides smooth

***Determination of total Ash value*:**
A thin porcelain dish was weighed and ignited flat. About 2 g of the powder sample was weighed into a dish or crucible supported the dish on a pipe clay triangle placed on a ring of retort stand heat with a burner, using a flame about 2 cm high and supporting the dish about 7 cm above the flame.
It was heated till vapors almost ceased to be evolved. Then the lower the dish and heated more strongly until all the carbon is burnt off. Then it was cooled in a dessicator. The ash was weighed and the percentage of total ash was calculated with reference to an air dried sample of the crude drug [9].

***Determination of acid insoluble Ash value*:**
The same procedure was followed for determination of total ash value of a sample. The powder was mixed with 25 ml of dilute HCl. Then ash was washed in the dish. The washed ash was placed in mere gauze over a Bunsen burner and boiled for 5 min. The ash was filtered by using an ash less filter paper. The residue was washed twice with hot water. The residue was ignited in a crucible. It was gently heated until vapor cease to be evolved. Then the desicator was cooled. The residue was

weighed and acid insoluble residue was with reference to the air dried sample of the crude drugs [9].

***Determination of alcohol soluble extractives*:**

About 4 g of the coarsely powdered drug was weighed in a weighing bottle and transferred it to a dry 250 ml conical flask. About 100 ml of solvent that is 90 % ethanol was filled in a 100 ml graduated flask to the delivery mark. The weighed bottle was washed and the washing was poured together with the remainder for the solvent into the conical flask. The flask was corked and kept set aside for 24 h. It was shaken frequently (maceration) and filtered into a 50 ml cylinder. When sufficient filtrate was collected, about 25 ml of the filtrate was weighed and transferred in to a porcelain dish. The filtrate was evaporated to dryness on water bath and the drying was completed in an oven at 105 °C for 6 h. The flask was corked and kept set aside for 24 h. It was shaken frequently (maceration) and filtered into a 50 ml cylinder. When sufficient filtrate was collected, the filtrate was transferred into a 25 ml of weighed thin porcelain dish. The dish was evaporated to dryness on water bath and the drying was completed in an oven at 105 °C for 6 h. The desicator was cooled for 30 min and weighed immediately. The percentage w/w of extractive was calculated with reference to the air dried sample of crude drug [9].

***Determination of water soluble extractive*:**

About 4 g of the coarsely powdered drug was weighed in a weighing bottle and it was transferred to a dry 250 ml conical flask. The 100 ml graduated flask was filled to the delivery mark with the chloroform (preservative). Washed out the weighed bottle and poured the washings, together with the remainder for the solvent into the conical flask. The flask was corked and kept set aside for 24 h. It was shaken frequently (maceration) and filtered into a 50 ml cylinder. When sufficient filtrate has collected, about 25 ml of filtrate was transferred to a weighed, thin porcelain dish. The dish was evaporated to dryness on water bath and the drying was completed in an oven at 105 °C for 6 h. The desicator was cooled for 30 min and weighed immediately. The percentage w/w of extractive was calculated with reference to the air dried sample of crude drug [9].

***Determination of water soluble Ash*:**

It was determined in a similar way to acid insoluble ash, using 25 ml of water, in place of dilute hydrochloric acid.

RESULTS AND DISCUSSIONS:

The results of organoleptic evaluation parameters like color, odour, and texture revealed that the herbal shampoo powder was fine and smooth. The color and odour of herbal shampoo powder was faint brownish and characteristics. The taste of powder was slight bitter. The general powder characteristic study showed that the particle size of powder was found to be in ranges of 20 to 25 µm. The bulk and tapped density of herbal shampoo powder was found to be 2.22 and 2.49 g/cc. The cars index was found to be 10.84 %. The Hausner ratio was found to be 1.121. The angle of repose was found to be 33 º. The flow properties data revealed that the flow property of Herbal Powder Shampoo was good. The pH of the shampoo powder was 4.3, which signifies that the herbal shampoo shall be non-irritating to the skin.

The herbal shampoo powder was found to be easily washable by water and it was sparingly soluble in water. The loss on drying of powder was 2.82 %, demonstrated that very least loss being taken place on drying. The skin irritation test revealed that the powder sample was found to be non-irritating to the skin. The dirt dispersion was moderate. The moisture content study revealed that very least moisture was found in herbal shampoo powder that is 4.39 %. The wetting time was 48 s. The cleaning action was found to be 30.11 min. The nature of hair after wash was found to be soft manageable. The solid content of herbal shampoo powder was 0.85 %. The easy of distribution was best.

The easy of rinsing and combing in wet were found to be better, where as easy of combing in dry form was best. The water soluble ash, acid insoluble ash and total ash value were 18.56, 16.9 and 3.4 % respectively. The water and alcohol soluble extractive valoe of herbal powder shampoo were 17.23 and 17.60 % respectively.

CONCLUSION:

From the result, in the present study, the prepared herbal shampoo powder formulation was comparable to the market shampoos in many parameters. Our data suggests that, prepared herbal shampoo powder is recommended as a choice product in cost effective hair care cosmetics. The present work focuses on the potential of herbal extracts from cosmetic purposes. Hence we conclude that the formulation of polyherbal shampoo powder is effective in reducing dandruff without irritation, less adverse effect and better conditioning effect. Present investigations was carried out to formulate the herbal

shampoo powder preparations based upon traditional knowledge and to develop few parameters for quality and purity of herbal powder shampoo.

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REFERENCES:

1. Ali HS, Rasool BK. Formulation and evaluation of herbal shampoo from *Ziziphus spina* leaves extract. Int J Res Ayur Pharmacy, 2011; 4(5): 1802-1806.
2. Arora P, Nanda A, Karan M. Shampoos based on symthetic ingredients vis-à-vis shampoos based on herbal ingredients: A review. Int J Pharm Sci Rev Res, 2011; 7(1): 42-46.
3. Chandran, S, Vipin KV, Augusthy AR, Lindumol KV, Shirwaikar A. Development and evaluation of antidandruff shampoo based on natural sources. J Pharmacy Phytother, 2013; 1(4): 10-14.
4. Deshmukh S, Kaushal B, Ghode S. Formulation and evaluation of herbal shampoo and comparative studies with herbal marketed shampoo. Int J Pharm Biosci, 2012; 3: 638-645.
5. Jaya PP, Padmini K, Srikanth J, Lohita M, Swetha K, Vengal RP. A Review on Herbal Shampoo and Its Evaluation. Asian J Pharm Anal; 2013; 3: 153-156.
6. Joan VR, Fatima GX, Shanmuganathan S, Chamundeeswari D. Preparation and Evaluation of Polyherbal Shampoo Powder. Int J Res Pharm Sci, 2013; 3: 60-66.
7. Krunali T, Dhara P, Meshram DB, Mitesh P. Evaluation of standards of some selected shampoo preparation. World J Pharmacy Pharm Sci, 2013; 2: 3622-3630.
8. Kumar A, Mali RR. Evaluation of prepared shampoo formulations and to compare formulated shampoo with marketed shampoos. Int J Pharm Sci Rev Res, 2010; 3: 120-126.
9. Mali RR, Kumar A, Singh AK, Talwar A. Formulation of herbal shampoos from *Asparagus racemosus*, *Acacia concin*, *Sapindus mukorossi*. Int J Pharm Sci Rev Res, 2010; 4(1): 39-44.

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