



## FORMULATION AND COMPARATIVE EVALUATION OF HERBAL SHAMPOO WITH MARKETED PRODUCTS

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### ABSTRACT

**Objective:** This study is focus to formulate a completely natural shampoo and its comparative evaluation with marketed products. **Materials and Methods:** In present work the preparation and evaluation of the shampoo of *lawsonia inermis*, *calendula officinalis* linn, *citrus limonum*, *citrus ulgaric* and *santolina trifoliatus*, leaf extract and compared with two marketed shampoos. The extract was concentrated under reduced pressure and weighed for determination of yield. Extraction was performed in selected herbs by different extraction procedure. **Results:** The result indicated that prepared herbal shampoo had good properties which were in comparison with an established marketed brand of synthetic anti-dandruff shampoo. The investigation reveals that synthetic preservatives have sometimes been the cause of adverse effects with consumers instead of herbal shampoo. **Conclusion:** The extract of are used to eliminate harmful synthetic ingredient from anti-dandruff shampoo formulation and substitute them with a safe natural ingredients. Formulated herbal shampoo shows good physical properties like pH, percentage of solids, foam formulation, retention, viscosity and dirt dispersion. The anti-fungal property also found within the range of satisfaction.

**Keywords:** Antidandruff shampoo, Herbal shampoo, Synthetic shampoos, Cosmetics.

### INTRODUCTION

Formulation of herbal cosmetics like shampoos, using totally raw material is a thought-provoking idea. The complications occurs in selection of materials that can be reasonably vindicated as natural and converting them into cosmetics which functionally comparable with their synthetic counterparts [1]. The present study focused on formulation of completely natural shampoo and its assessment with the commercial products. Shampoos are basically the mixture of detergent and surfactants and may be describe as a cosmetic preparation which is used for washing of hair and scalp [2]. Its primary function is to cleanse of sebum, scalp debris and residues of hair grooming preparations. The added functions of a good shampoo include lubrication, conditioning, body building, and prevention of static charge build up and finally the complete shampoo formulation must be medically safe for long term usage [3]. Shampoos primary function, viz., cleaning should be selective and should preserve a necessary quantity of the natural oil that coats the hair and scalp. But cleaning of scalp and hair presents different problems. Many of marketed products found to have side effects like dryness of hair after prolonged use and leave the hairs too dry to handle with comb. Some shampoos causes irritation to the eye and lasting corneal cloud. Skin irritation is another marketed parameter. Some shampoos starts promoting hair loss upon frequent use. So achieving good looking and healthy hairs by using shampoos without the side effects is challenging goal for cosmetic industry. The cost of such kind of shampoos is another marked consideration. Awareness has been created among the human being of cosmetic industry which led towards the more usage of herbal products, neutraceuticals and medicines for good living. Now the cosmetic industry and market is driven by the fundamental shift in demand for herbal based products. Many researchers and scholars have been found that good looking and healthy hair without any side effects can be achieved by replacing synthetic ingredients of shampoos by herbs like some common kitchen ingredients, some special oils and flower extracts. Many studies have been reveals that hairs can respond quickly by using such kind of herbal formulation. Commercially available herbal shampoos are not completely natural but contain herbal extract in synthetic detergent base along with other chemical additives. So the main focus of this study is to formulate a completely natural shampoo and its comparative evaluation with marketed products.

#### Henna

Leaves of the palnt *lawsonia inermis*. Family – lythraceae is widely used in cosmetology the plants are also commonly known as henna or mehendi. In cosmetic industry the plant is widely used for its strong dyeing property. Henna is used as favorite hair dye. Its also shows antibacterial and anti-fungal activity. Studies reveal that its strong dyeing property is attributed by lawsone which is the main chemical constituent. The thiol group of lawsone is strongly bound with the keratin of hairs [4].

#### Marigold

Marigold consists of flower of plant *calendula officinalis* linn. Family – asteraceae. The flowers of marigold contain flavonoids, carotenes, xanthophyllin and essential oils. Water infusion of flower is used for washing of sore and irritated skin. It is also used as itch relevant [5].

#### Lemon

Lemon contains the fresh juice of from the fruits of plant *citrus limonum* family rutaceae. Juice contains hesperidin, pectin, limonene, citral and terpineol. It is used as a stimulant, anti-septic and anti- dandruff agent [6].

#### Orange

Orange peel is dried or fresh outer part of the pericarp of the ripe or nearly ripe fruits of citrus ulgaric. Family rutaceae. It contain volatile oil, hesperidine, iso- hesperidine, neo-hesperidine, vitamin C and pectin. Infusion of peel is used as a hair rinse. It is also used as a stomatic, carminative and flavoring agent [7].

#### Reetha

Reetha is batinated from dried fruits of *santolina trifoliatus*. Family sapindus. It contains saponin, hederagenin, oleanolic, sapindic acid, saponin A and B sesquiterpenes, trifolioside – II. It is used as a detergent, demulcent and astringent [8].

### MATERIAL (HERBS) AND METHOD

#### Plant material

The herbs used in the preparation of herbal shampoo, was authenticated by Department of Crop and Herbal Physiology J.N.K.V.V. Jabalpur. The plant material was dried, powdered and sieved and stored in well-closed container for further studies.

### Chemicals

Petroleum ether, acetic acid are purchased from CDH Mumbai of AR grade

### Extraction procedure

The powdered form of (100 g) *S. trifoliatum*, *C. Officinalis*,

*I. inermis* and *C. Ulgaric*, *C. limonum* were extracted with distilled water and ethyl acetate in soxhlet apparatus for 6 hrs respectively. The extract was concentrated under reduced pressure and weighed for determination of yield. Extraction were performed in selected herbs by different extraction procedure are given in Table

**Table 1: Extraction of herbs.**

| S.no. | Herbs  | Extraction of herbs   |
|-------|--|---|
| 1.    | <i>Santolina trifoliatum</i> (reetha)        | Reetha was extracted by decoction. 50 gm powdered reetha placed in a stainless steel vessel and poured 287.5 ml of distilled water and covered. mixture was kept for boiling till the water reduced to one quarter than strain and filtered |
| 2.    | <i>calendula officinalis</i> linn (marigold) | Marigold was extracted with distilled water by infusion. 50 gm dried flowers of marigold taken in a stainless steel vessel and poured 287.5 ml of boil water, cover it and leave for 12 hrs than strain and filtered                        |
| 3.    | <i>citrus ulgaric</i> (orange)               | Orange peels were extracted by infusion with ethyl acetate. 50 gm of dried orange peel in a vessel and poured 287.5 ml of boil ethy acetate, cover at least for 12 hrs.   |
| 4.    | <i>lawsonia inermis</i> (henna)              | Henna was extracted by decoction. 50 gm powdered reetha placed in a stainless seel vessel and poured 287.5 ml of water and covered. mixture was kept for boiling till the distilled water reduced to one quarter than strain and filtered   |
| 5.    | <i>citrus limonum</i> (lemon)                | Extraction of lemon juice was carried out with boil ethyl acetate by simple mechanical process.   |

### PREPARATION OF THE HERBAL SHAMPOO [9]

For the preparation of the herbal shampoo, extract of the all herbs were mix together with additives. Formula of herbal shampoo (for 100 ml) has shown on Table 2.

**Table 2: Formula of herbal shampoo (for 100 ml):**

| S.No. | Herbal extract      | Quantity |
|-------|---------------------|----------|
| 1     | Reetha extract      | 20 ml    |
| 2     | Henna extract       | 20 ml    |
| 3     | Marigold extract    | 20 ml    |
| 4     | Orange peel extract | 20 ml    |
| 5     | Lemon juice         | 20 ml    |
| 6     | Tragacanth gum      | 1.0 gm   |

### EVALUATION OF HERBAL SHAMPOO

A comparative evaluation of herbal shampoo with commercially available marketed products was carried out by using following parameters-

**Determination of pH [10]:** 1% solution of formulation was prepared along with the standard marketed products and pH was determined by digital pH meter. 1% solution of shampoo was prepared by mixing 2ml of shampoo in 200 ml of distilled water in a beaker swirl the beaker to mix the shampoo with water without shaking the beaker.

### Determination of percentage of solids

In this test first of all the weight of clean, dry and empty evaporating dish was measured and recoded than approximately 4 gm sample of formulated herbal shampoo was placed in evaporating dish by measuring the weight of evaporating dish the exact initial weight of shampoo was calculated. Dried weight of shampoo was recorded by placing the evaporating dish on hot plate until the shampoo completely evaporated. The percentage of solids was calculated by the following formula

$$\text{Percentage of the solids} = \frac{\text{Dried weight of shampoo}}{\text{Initial weight of shampoo}} \times 100$$

### Determination of the foam formulation [11]

The volume of foam produced by the formulated herbal shampoo was determined by placing 50 ml of shampoo in to the clean and dry measuring cylinder and initial volume was recorded. The final volume was recorded by shaking the measuring cylinder 10 times and the foam formulation was calculated as follows –

$$\text{Foam formation} = \text{final volume of shampoo} - \text{initial volume.}$$

### Foam quality and retention

Immediately, after the determination of the foam formulation test the test for foam quality and retention was started. Retention of

foam volume was recorded in each 1 mint time interval and the graph was plotted.

### Determination of the viscosity [12]

The viscosity of the formulated shampoo was determined by using Brookfield Viscometer (Model DV-I Plus, LV, USA) set at different spindle speeds from 0.3 to 10 rpm. Spindle T95 was used to measure the viscosity of all shampoos. The temperature and sample container's size was kept constants during the study.

### Dirt dispersion test:

Take 2 drops of shampoo in test tube and make the volume up to 10 ml by adding dist. Water finally add 1 drop of India ink and shake the test tube 10 times. The amount of ink present in the foam was carefully noted.

### Determination of surface tension

Determination of surface tension was carried out with a 10% shampoo solution in distilled. The stalagmometer was cleaned by using chromic acid and purified water because surface tension is highly affected in presence of grease or other lubricants. The data was calculated by following equation given below:

$$R_2 = (W_3 - W_1) N_1 \times R_1 (W_2 - W_1) N_2$$

Where,

**W1** is weight of empty beaker. **W2** is weight of beaker with distilled water. **W3** is Weight of beaker with shampoo solution. **N1** is no. of drops of distilled water. **N2** is no. of drops of shampoo solution. **R1** is surface tension of distilled water at room temperature. **R2** is surface tension of shampoo solution.

Antifungal activity- anti-dandruff activity of the shampoo was determined by adopting disc-diffusion method. Potato Dextrose Agar (PDA) medium was used as a culture medium for fungus. Dandruff was dissolved in PDA medium. The inoculums obtained were serially diluted and inoculums were inoculated in to the PDA petri dishes by the help of nichrome wire. The Petri plates were incubated at 30 degree Celsius for 48 hours. Then dilutions of shampoo prepared and poured into cylinders of stainless steel and incubated, the growth of fungus were checked at regular intervals. Finally the zone of inhibition was noted for all samples.

### RESULTS AND DISCUSSION [13]

From the time when the time of Charaka and Sushruta a lot of herbal medicines in different formulations have been recommended for the treatment of diseases and care of human being [14]. The prepared formulation and their evaluation are discussed in different parameter is

### pH determination

pH is an important parameter for the evaluation of the shampoo because pH is responsible for eye irritation and skin irritation while it is necessary for good shiny hair and tightening of scalp. Alkaline

shampoos are generally promote swelling of scalp and make them open up that's why cosmetic manufacturer provide wide pH range of shampoos rather than a fixed pH value. But according to new trends, mild acidic pH shampoos gaining popularity among the consumers. The formulated herbal shampoos shows pH value  $5.91 \pm 0.01$  given in Table 3, which is close to the skin pH and its other marketed counterparts.

**Table 3: pH determination of marketed sample and prepared formulation of herbal shampoo:**

| S.no. | Sample                  | pH              |
|-------|-------------------------|-----------------|
| 1     | Ayur herbal shampoo     | $5.51 \pm 0.02$ |
| 2     | Nyle herbal shampoo     | $5.53 \pm 0.07$ |
| 3     | Prepared herbal shampoo | $5.91 \pm 0.01$ |

#### Percentage of solids

Studies shows that if a shampoo has higher % of solids in it than it is hard to wash out but if it doesn't have enough solids than it will remain watery and quickly washed out upon use. An ideal shampoo should have 20 – 30 % solids for its balanced cleaning action which is found and given the Table 4:

**Table No. 4: Percentage of solids in marketed sample and prepared formulation of herbal shampoo:**

| S.no. | Sample                  | % of solids |
|-------|-------------------------|-------------|
| 1     | Ayur herbal shampoo     | 25%         |
| 2     | Nyle herbal shampoo     | 30%         |
| 3     | Prepared herbal shampoo | 20%         |

#### Dirt dispersion

Shampoo that promotes the ink to accumulate in the foam is considered poor quality. Dirt that stays in the foam will be difficult to rinse away, dirt should stay in water. If it remains in foam, it will

**Table No. 7: Viscosity Profile of marketed sample and prepared formulation of herbal shampoo.**

| Speed in rpm | Ayur herbal shampoo |           | Nyle herbal shampoo |           | Prepared herbal shampoo |           |
|--------------|---------------------|-----------|---------------------|-----------|-------------------------|-----------|
|              | % tor               | viscosity | % tor               | viscosity | % tor                   | viscosity |
| 0.3          | 15.35               | 95732.33  | -                   | -         | 14.35                   | 84435.00  |
| 0.5          | 21.85               | 82154.00  | 16.15               | 607663    | 19.52                   | 73582.00  |
| 1.0          | 32.87               | 54156.00  | 22.72               | 42664.66  | 27.65                   | 51516.33  |
| 1.5          | 41.34               | 50916.67  | 26.50               | 33348.00  | 31.33                   | 40450.00  |
| 2.5          | 50.70               | 38777.33  | 31.92               | 22998.00  | 38.33                   | 28851.21  |
| 5.0          | 66.63               | 25425.00  | 38.86               | 14545.00  | 47.56                   | 17652.00  |
| 10           | 83.23               | 15776.00  | 46.40               | 85410.00  | 57.23                   | 10741.21  |

#### Foam quality and retention

The volume of foam which is produced by a shampoo should be stable and should remain at least for 5 minutes lesser than this may cause consumer dissatisfaction. In our study all sample shows good retention time in Table 8.

**Table No. 8: Foam quality and retention in marketed sample and prepared formulation of herbal shampoo:**

| S.No. | Sample                  | Volume of foam |          |          |          |
|-------|-------------------------|----------------|----------|----------|----------|
|       |                         | 1 minute       | 2 minute | 3 minute | 4 minute |
| 1     | Ayur herbal shampoo     | 430 ml         | 430 ml   | 430 ml   | 430 ml   |
| 2     | Nyle herbal shampoo     | 420 ml         | 420 ml   | 420 ml   | 420 ml   |
| 3     | Prepared herbal shampoo | 400 ml         | 400 ml   | 400 ml   | 400 ml   |

#### Determination of surface tension

Previous studies has been reveals that an ideal shampoo should be able to reduce the surface tension of dist. water from 72 dynes/cm to about 40 dynes/cm. Formulated herbal shampoo reduced surface tension of water up to 33.17 dynes/cm given in Table 9, which is an indication of its good cleaning and detergent property.

redeposit on the hair. All samples of shampoos show satisfactory result in our study which is shown in Table 5.

**Table No. 5: Dirt dispersion in marketed sample and prepared formulation of herbal shampoo:**

| S.no. | Sample                  | Dirt dispersion |
|-------|-------------------------|-----------------|
| 1     | Ayur herbal shampoo     | none            |
| 2     | Nyle herbal shampoo     | light           |
| 3     | Prepared herbal shampoo | moderate        |

#### Foam formation

However generation of foam by a shampoo has a less correlation with its cleaning ability but it represent the physical appearance of product so it is gain enough importance as evaluation parameter. A good shampoo should produce 100 ml or more foam during the test and the bubbles of the foam should be small given in Table 6, because smaller the bubbles the longer the foam will persist.

**Table No. 6: Foam formation in marketed sample and prepared formulation of herbal shampoo**

| S.no. | Sample                  | Foam volume | Bubble size |
|-------|-------------------------|-------------|-------------|
| 1     | Ayur herbal shampoo     | 380 ml      | small       |
| 2     | Nyle herbal shampoo     | 370 ml      | small       |
| 3     | Prepared herbal shampoo | 350 ml      | Small       |

#### Viscosity

Viscosity is a thickness or thickness of a liquid. Viscosity of shampoo is depending on the % of solids present in the shampoo. In Table 7, results shows that the viscosity of samples gradually change with increases in rpm and shows pseudo plastic behavior and all the samples shows pseudo plastic rheogram which is desirable for an ideal shampoo.

**Table No. 9: Determination of surface tension in marketed sample and prepared formulation of herbal shampoo:**

| S.no. | Sample                  | Surface tension (dy/cm) |
|-------|-------------------------|-------------------------|
| 1     | Ayur herbal shampoo     | $30.12 \pm 0.02$        |
| 2     | Nyle herbal shampoo     | $31.25 \pm 0.01$        |
| 3     | Prepared herbal shampoo | $33.17 \pm 0.01$        |

#### Antifungal activity

Dandruff characterizes by excessive scaling of scalp tissue. It is chronic, non-inflammatory condition of the scalp one of the most common dermatological skin condition. In antifungal activity all samples shows a significant zone of inhibition against the fungus which may be attribute by their herbal ingredients like lemon, orange peel, henna which well thought out to possess anti-fungal property in Table 10.

**Table No. 10. Antifungal activity in marketed sample and prepared formulation of herbal shampoo:**

| S.no. | Sample           | Zone of inhibition |
|-------|------------------|--------------------|
| 1     | Ayur             | 25.26 mm           |
| 2     | Nyle             | 23.32 mm           |
| 3     | Prepared shampoo | 18.33 mm           |

#### CONCLUSION

Study shows that dandruff affects 5% of the population and mostly occurs after puberty, between 20-30 years and affects males

more than females. Formulation of any cosmetic product by complete raw and natural material is a difficult task. The main challenge lies in selection of natural material which can be rationally justified and comparable to that of synthetic material. In present study our aim is to develop an herbal shampoo which would be completely natural. However the formulated shampoo shows good rheological properties and is comparable with its marketed counterparts but its detergent and cleaning property was found somewhat less in comparison to marketed products. It can be justified by the fact that marketed shampoo contains some synthetic ingredients like thickening agents and surfactants which promote better cleaning properties. Formulated herbal shampoo shows good physical properties like pH, percentage of solids, foam formulation, retention, viscosity and dirt dispersion. The anti-fungal property also found within the range of satisfaction.

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