

**INTERNATIONAL JOURNAL OF ADVANCES IN
PHARMACY, BIOLOGY AND CHEMISTRY**

Research Article

Screening of some Herbal preparations for Hair care

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ABSTRACT

The present study was conducted with an aim of developing a purely herbal shampoo with no side effects of chemicals. The herbal shampoo developed in the present study is safe to use and also cost effective. The first step was to select a few well known, locally available herbs for the shampoo preparation. The saponin content was checked, for a good lathering effect without adding any chemicals. From the study it was concluded that *Albizia amara*, *Azadirachta indica*, *Acacia concinna*, *Sapindus laurifolius* and *Vigna radiata* had very high saponin content and therefore had good foaming index, haemolysis effect, and high crude saponin content. Keeping three of these as the lathering herbs, four more herbs, which are generally known to be good for hair care, were added as key ingredients. Along with these seven, three more herbs were varied in each of the seven shampoos (S_1 to S_7), to check the best overall effect and the anti-lice property.

The study also showed a combination of – *Emblica officinalis*, *Centella asiatica*, *Ocimum sanctum*, *Eclipta alba*, *Hibiscus rosa-sinensis*, *Acacia concinna*, *Sapindus laurifolius*, *Albizia amara*, *Azadirachta indica* and *Lawsonia inermis* had good antilice property when extracted in petroleum ether.

The *in vivo* efficiency of the shampoo was studied by taking the feedback analysis of the seven shampoos prepared, from ten volunteers. The feedback analysis showed each of the seven shampoos having some advantage or the other. It was therefore concluded that the herbs could be selected based on the specific needs.

Key words: Herbal shampoo, Hair care, Saponin, Anti-lice and Feedback analysis.

INTRODUCTION

It is best to go by the natural care route for hair care because our body cannot differentiate between good and bad chemicals. It indiscriminately absorbs whatever chemicals we slather on our face and body and thus causes adverse effects. By choosing natural hair care products we know that our body is absorbing products rooted in nature and simply prepared by hand within the highest quality with least chemical processes. We can also be assured that no product will introduce a rash, irritation or allergic reaction because its ingredients are pure and natural.

In the present study an attempt has been made to use the dry shampoo powder which are known but have not been particularly popular, largely because they are rather inefficient in removing sebum from the hair. The existing shampoos that are available in the market are mainly made out of inorganic chemicals, and even some of the so-called herbal shampoos contain inorganic chemicals to retain liquid form, which are injurious to human skin. The inorganic chemicals in the shampoo give a sheen or layer on the

scalp of the skull between the hair roots which can lead to dandruff. In some of the available dry shampoos, starch is used as the active powder, which tends to remain attached to the hair and is not readily removed. It has also been found that some dry shampoos are formulated with other powders such as activated carbon and alumina. These shampoos are not desirable because they are not biodegradable and are difficult to remove from the hair.

The cleansing or detergent action of a shampoo is a primary function. The foaming characteristic of a shampoo also has an important role in its acceptability. Often alkanolamides are used for the formation of stable foam; but because of producing nitrosamines, they are potentially carcinogenic compounds. Hence, the main goal of this study was the elimination of these materials from shampoo formulations. Saponins have a triterpenoid core. As a consequence of their surface active properties, saponins are excellent foaming agents, forming very stable foams. Because of their surfactant properties,

they are used in cosmetic products such as lipstick and shampoo. (Nasrin A *et al.*, 2006)¹. Saponin is one of the natural washing agents that help to absorb excess sebum without causing adverse reactions. In addition to the emollient effect of saponins their antibacterial and antifungal properties are important in cosmetic applications (Kulandhaivel M *et al.*, 2011)². The herbal shampoo powder prepared using natural ingredients like *Ocimum sanctum* and *Azadirachta indica* are also capable of high foaming property (Mohamed HS *et al.*, 2009)³. Hence as the first step in the present study we have screened the herbs to be used in the shampoo, for the saponin content and selected those with high saponin content. Earlier studies have also been conducted with several other herbs with an aim of providing a herbal shampoo cum hair cleaning composition comprising of *Accacia concinna*, *Eclipta alba*, *Melia azadirachta*, *Lawsonia alba*, henna powder, multanimitti (clay) and *Sapindus trifolatis*. (Choudary GP, 2006)⁴.

Evaluation of shampoos comprises the quality control tests including visual assessment and physicochemical controls such as pH, density and viscosity. Sodium lauryl sulfate based detergents are the most common but the concentration will vary considerably from brand to brand and even within a manufacturer's product range. Cheap shampoos may contain a high detergent concentration while expensive shampoos may contain very little of a cheap detergent. Shampoos for oily hair can have exactly the same detergent at the same concentration as shampoos for dry hair. The difference is more likely to be a reduced amount of oil or conditioning agent in the shampoo for oily hair or the difference may even just be the packaging. (Ashok K and Mali RR, 2000)⁵. Use of sodium lauryl sulphate has to be reduced as it is a skin irritant (Babich H and Babich JP, 1997)⁶. The isolated rabbit eye (IRE) test and bovine corneal opacity and permeability (BCOP) assay were evaluated for their ability to predict the eye irritation potential of a range of hair shampoo formulations some containing a novel non-surfactant ingredient known to be an ocular irritant. (Cooper KJ *et al.*, 2001)⁷. Chemically based shampoos can induce allergic contact dermatitis which is difficult to diagnose clinically because it can involve multiple and variable areas where the shampoo flows. (Chih WH *et al.*, 2010)⁸.

Herbal shampoos are also known to be very effective against the human louse. Two formulations of herbal shampoo from long pepper fruit (*Piper retrofractum*) extracts, formulation 1 (10% concentrations of long pepper fruit extracts) and formulation 2 (3% concentration of long pepper fruit extracts) were tested against human louse (*Pediculus capitis*). Both

herbal shampoo showed insecticidal effect on the lice of 99-100% mortality occurred (Rassami W and Soonwera M, 2011)⁹ and (Soonwera M, 2015)¹⁰. The development and clinical testing of an herbal lice removal shampoo containing a standardized extract of paw paw, thymol, tree tea oil are effective. (Mc Cage CM *et al.*, 2004)¹¹. In the present study therefore there has been an attempt to study the *in vitro* anti-lice effect of the formulated shampoos, since getting live volunteers was difficult.

It is therefore an object of the present study to provide an efficient, non-toxic, biodegradable dry herbal powder shampoo composition. It is another object of the present study to provide a herbal dry shampoo composition having a longer shelf life and not requiring any chemical preservatives. The dry herbal shampoo has a shelf life of three to four years after it is packed. (Prabhmanju M *et al.*, 2009)¹². The herbal shampoos developed in the present study are 100% herbal with no synthetic chemicals. Moreover, the herbal shampoo developed here is also a very economical one, as all the essential ingredients are naturally found in abundance. All the important constituents of the present invention are natural and non-toxic according to the intended use.

The aim of the present study may be summarized as follows:

- To screen the herbs to be used for their saponin content.
- To use dry powdered forms of the herbs in various combinations.
- To standardize a simple method of herbal shampoo preparation.
- To study the anti-lice effect of the different shampoos prepared.
- To finalize the best combination of herbs by taking the feedback from volunteers.

From the study we have concluded that *Albizia amara*, *Azadirachta indica*, *Acacia concinna*, *Sapindus laurifolius* and *Vigna radiata* had very high saponin content and therefore had good foaming index. The S2 Shampoo which had 10 herbs showed good anti-lice activity and thus this herbal formulation can be considered as a good pediculicidal agent.

MATERIALS AND METHODS

Plants collected and used:

The leaves, flowers, fruit rind, roots and seeds of the following plants which were previously reported to have saponin contents were chosen for the present study. The plants used were:

1. *Embllica officinalis*:

Common name – Amla.

- Family - Euphorbiaceae.
Part used - Fruit.
It is natural hair conditioner as well as nourishing agent it has anti-inflammatory and antioxidant properties. It is also used as a hair tonic (Gupta *et al.*, 2010)¹³.
2. *Centella asiatica* :
Common name - Brahmi
Family - Apiaceae
Part used - Whole plant
Are juvenator and conditioner. It has anti-inflammatory and antimicrobial property. (Gupta K *et al.*, 2010)¹³.
3. *Eclipta alba*:
Common name - Bhringraj
Family - Asteraceae
Part used - whole plant
It is used as hair tonic. It is used as a constituent for healthy hair (Gupta K *et al.*, 2010)¹³.
4. *Hibiscus rosa-sinesis*:
Common name - Hibiscus
Family - Malvaceae
Part used - Leaves and Flowers
Leaves and flowers are used to stimulate hair growth, to prevent premature greying, hair loss and scalp disorders (Gupta K *et al.*, 2010)¹³.
5. *Acacia concinna*:
Common name - Shikakai
Family - Fabaceae
Part used - Seed, fruit pod
It is used as natural hair cleanser and astringent, also promotes hair growth prevents dandruff and strengthen hair (Gupta K *et al.*, 2010)¹³.
6. *Sapindus laurifolius*:
Common name - Reetha
Family - Sapindaceae
Part used - Fruit rind
It has antimicrobial property. It cleanses the scalp (KulandhaivelM *et al.*, 2011)².
7. *Albizia amara*:
Common name - Chigare
Family - Mimosaceae
Part used - Leaves
It promotes hair growth, nourishes and improves the strength of the hair. It has antifungal property.
8. *Trigonella foenum-graecum*:
Common name - Methi
Family - Fabaceae
Part used - Seeds
It promotes hair growth and maintains natural hair colour also cures dandruff and keeps hair silky (Gupta K *et al.*, 2010)¹³.
9. *Punica granatum*:
Common name - Pomogranate
Family - Lythraceae
Part used - Seeds
It prevents hair loss and controls the menace of dandruff (Prabhmanju M, 2012)¹⁴.
10. *Terminalia chebula*:
Common name - Haritaki
Family - Combretaceae
Part used - Fruit
It has strong antibacterial property. It prevents dandruff and nourishes hair.
11. *Terminalia bellarica*:
Common name - Vibhitaki
Family - Combretaceae
Part used - Fruit
It helps in overcoming of premature greying of hair.
12. *Azadirachta indica*:
Common name - Neem
Family - Meliaceae
Part used - Leaves
It is used as antidandruff agent as well as conditioner (PathakK and Das RJ, 2013)¹⁵.
13. *Ocimum sanctum*:
Common name - Tulsi
Family - Lamiaceae
Part used - Leaves
It stimulates and promotes hair growth; it also hydrates the scalp preventing the hair from becoming dry and helps in removing flakes of dandruff (HalithSM *et al.*, 2009)¹⁶.
14. *Lawsonia inermis*:
Common name - Henna
Family - Lythraceae
Part used - Leaves
It is used as good hair conditioner, promotes hair growth and dyes the hair (Gupta K *et al.*, 2010)¹³.

15. *Cymbopogon citratus*:
Common name – Lemon grass
Family - Poaceae
Part used - Leaves
It has antimicrobial and antibacterial property (NaikMI *et al.*,2010)¹⁷
16. *Camellia sinensis*:
Common name – Green tea
Family - Theaceae
Part used - Leaves
It has antioxidant property. It is used as nourishing agent (KulandhaivelM *et al.*, 2011)²
17. *Vitex negundo*:
Common name - Vitex
Family - Verbenaceae
Part used - Leaves
It has antibacterial property also promotes the hair growth.
18. *Vigna radiata*:
Common name – Green gram.
Family - Leguminosae.
Part used - Seeds.
It is used in hair wash due to its good lathering effect and in many of the shampoo preparations, it consists of antidandruff property.
19. *Cicer arietinum*:
Common name – Bengal gram.
Family - Leguminosae.
Part used - Seeds.
Bengal gram is a rich source of protein. It makes an excellent ingredients in hair care products. It moisturises and cleans the scalp.
20. *Annona squamosa*:
Common name – Custard apple.
Family - Annonaceae.
Part used - Seeds.
It is insecticidal and are useful in destroying lice (Junya Iet *al.*, 2006)¹⁸
21. *Ficus benghalensis*:
Common name – Banyan
Family - Moraceae
Part used - Aerial root tips.
The roots of banyan are said to be used in nourishing hairs.
The above list of herbs were selected based on literature survey and also some were selected based on traditional knowledge.

Test for detecting the presence of saponin contents:

a. Foaming index:

The plant extract was prepared by boiling one gram of powdered sample with 100ml of distilled water at 60⁰ C for 30 minute in hot water bath. The plant extract was then cooled and filtered in a standard volumetric flask. The volume was made up to 100 ml by using distilled water. From standard volumetric flask the plant extract was taken in different concentrations and diluted with distilled water, each dilution was made up to 10ml. About 10 different dilutions were prepared in a stoppered test tube. Each test tube was vigorously shaken for about 15mins and then the test tube was kept aside for 60 sec undisturbed. Then the presence and absence of foam was determined. The height of the foam was measured. (Plate: 2)

The foaming index of each plant sample was calculated as follows

- If the height of the foam in all the dilutions of a sample was more than 1cm, the foaming index value was considered to be <100.
- If the height of the foam in the first two dilution started with 1cm or more than 1cm, the foaming index value is said to be <1000.
- If the height of the foam was more or equal to 1cm in any of the dilutions in the series, then the foaming index was calculated by using the formula- $FI = 1000/a$

Where, FI is foaming Index and 'a' is the volume of plant extract added in that particular dilution. (Das K, 2010)¹⁹

b. Fractional method for extraction of Saponin:

This test was conducted on the raw drugs which showed the best results in foaming index.

One gram of powdered sample was defatted by adding 1ml of petroleum ether. After 15mins the petroleum ether extract was discarded. The residue (marc) was taken and dissolved in methanol, ethanol and distilled water taken in the ratio of 1:1:1. The extract was filtered, the marc was discarded and methanol was evaporated from the extract by keeping the extract in a watch glass without disturbing for about an hour. Then to the extract 1ml of water saturated n-butanol was added (water saturated n-butanol was prepared by dissolving water in butanol in the ration of 6:4 i.e., 6 parts of water in 4 parts of butanol). The upper n- butanolic phase was retained and the lower aqueous phase was discarded. To the butanolic phase 5ml of ethyl acetate was added and precipitate was formed. The precipitate was then centrifuged at 1000rpm for about 10mins. The crude

saponin was obtained. Finally, the crude saponin was weighed. (SengerNPS *et al.*, 2009)²⁰

c. Haemolysis:

This test was conducted to confirm the results of the previous test.

To the prepared plant extract, one gram of powdered sample was suspended overnight in 10ml of petroleum ether (to de-fat the plant sample). Centrifuged at 10,000rpm for 5 minutes. The pellet was completely dried and later the pellet was suspended overnight in 10ml of 0.02M phosphate buffer saline (pH=7.2). Centrifuged at 10,000rpm for 10 minutes. The supernatant was collected.

Human blood sample (2ml) was taken and repeatedly washed with phosphate buffer saline (6-9 times). The sample was centrifuged at 2000rpm for 10mins. The phosphate-buffer saline (PBS) was discarded after each wash. Then finally blood sample was taken for further analysis.

Cavity blocks were taken and in each cavity block 50µl of blood sample were added along with the 50µl of the plant extract. The mixture was then mixed thoroughly using a wooden toothpick. The cavity blocks were covered and left undisturbed for about an hour. A Glass VDRL plate (Cavity slides) were used, a small drop of mixture from the cavity block was added on to the slide and the cover slip was placed. The slide was observed under the microscope (high power). Absence of agglutination and presence of haemolysis indicates the presence of saponin content and absence of lectin. (Moore BPL, 1980)²¹

(Plate: 3)

Anti-lice activity:

The prepared shampoos were tested for anti-lice activity by filter paper diffusion method.

Preparation of extract: Each shampoo material was taken in a Soxhlet apparatus and extracted with two different solvents. The solvents used for the extraction were petroleum ether (60°C) and distilled water (40°C).

Two to three lice were placed on a filter paper in petri dish and kept open. A volume of 0.5ml of each test sample was poured on the test organism and allowed to spread all over the filter paper. A control was maintained where only distilled water and petroleum ether were used. The petroleum ether extraction was made 10% by adding 1ml of distilled water. All the petri dishes were placed in a dark chamber at 26±0.5°C and 70±1% humidity.

At the end of 1 hour, the petri dishes were taken out and again 0.5 ml of respective extract was added. The petri plates were again left in dark chamber. After every 5 hours the plates were observed for the movement of lice. Absence of movement indicated the death of lice. (SukiritiU *et al.*, 2011)²². (Plate:4).

Preparation of Shampoos:

For the shampoo preparation, the herbs mentioned above were collected, thoroughly washed and then oven dried at 60 °C for 3-4 days. Then the dried herb was powdered and bottled for the studies and also for the shampoo preparation. (Dubey *Set al.*, 2004)²³. Five shampoos were prepared by mixing different powdered herbs. Seven ingredients were used as common ingredients and three as variables in each shampoo preparation. Equal quantities of each powdered herb was weighed and all the ingredients were mixed properly and sieved. Then the shampoos were packed and labelled as S₁, S₂, S₃, S₄ and S₅. (Plate: 1)

Standard ingredients:

1. *Emblca officinalis*.
2. *Centella asiatica*.
3. *Eclipta alba*.
4. *Hibiscus rosa-sinensis*.
5. *Acacia concinna*.
6. *Sapindus laurifolius*.
7. *Albizia amara*.

Variable Ingredients:

S₁: 1. <i>Punica granatum</i> . 2. <i>Terminalia chebula</i> . 3. <i>Terminalia bellarica</i> .	S₂: 1. <i>Azadirachta indica</i> . 2. <i>Ocimum sanctum</i> . 3. <i>Lawsonia inermis</i> .	S₃: 1. <i>Cymbopogon citratus</i> . 2. <i>Camellia sinensis</i> . 3. <i>Ficus bengalensis</i> .
S₄: 1. <i>Annona squamosa</i> . 2. <i>Vigna radiata</i> . 3. <i>Camellia sinensis</i> .	S₅: 1. <i>Cymbopogon citratus</i> . 2. <i>Trigonella foenum-graecum</i> . 3. <i>Cicer arietinum</i> .	

To understand the *in vivo* effect of the seven shampoos prepared, an analysis of the shampoo was done on the volunteers. An exhaustive feedback form was prepared and given to the volunteers to get their opinions. The forms along with the seven shampoos was given to 10 such volunteers and they were required to use the shampoo for 3-4 washes over a period of two weeks. The forms were then collected back and the average of the 10 volunteers were done for each aspect. The 18 criteria of the survey sheet were grouped into four broad aspects of: 1- Likeability aspects, 2- Performance aspects, 3- Functionality aspects and 4-Dandruff aspects. An average rating was then calculated for each aspect.

RESULTS AND DISCUSSION

In our screening of herbal shampoo preparation, the study of saponin content was done in three parts:-

a. Foaming index: (Plate 2, Table 1)

From the study conducted on foaming, it has been clear from Table 5 that the five herbs which showed good foaming capacity were *Albizia amara*, *Vigna radiata*, *Acacia concinna*, *Sapindus laurifolius* and *Azadirachta indica*.

b. Fractional method of extraction of Saponin content –(Table 2, Fig 1)

The study on saponin content showed highest value for *Albizia amara* followed by *Azadirachta indica* and the least was seen in *Acacia concinna*.

c. Haemolysis – (Plate 3)

To reconfirm the presence of saponins in the five plants mentioned above, this test was done. The haemolysis was seen with all the five samples which reaffirmed the presence of saponins.

The three tests conducted for saponin provided an ample proof for the presence of saponin and thereby the lathering effect of the herbs. Based on which the herbs were included for shampoo preparation.

Saponin is known to be one of the natural washing agents that help to absorb excess sebum without causing adverse reactions. In addition to the emollient effect of saponins, their anti- bacterial and antifungal properties are important in cosmetic applications (KulandhaivelM *et al* 2011)². Hence in this study three herbs, *Acacia concinna*, *Sapindus laurifolius* and *Albizia amara*, which had high saponin content were included in the shampoo.

In second part of the study, the five shampoos were prepared by mixing the powdered ingredients in the ratio of 1g each. Five different shampoos were prepared and tested for antilice activity. The

petroleum ether extracts showed good antilice activity compared to aqueous extracts of the herbs. Of all the five prepared shampoos, the petroleum ether extract of S2 showed the best antilice activity closely followed by S3, since the number of hours for the lice to stay live was least compared to other shampoo extracts. The earlier studies on antilice activity considered the herbs individually, when extracted in different solvents but in the current study a combined effect of all the herbs together was analyzed for the pediculicidal effect.

From the saponin study on crude herbs, we have concluded that five herbs namely- *Albizia amara*, *Azadirachta indica*, *Acacia concinna*, *Sapindus laurifolius* and *Vigna radiata* had fairly high saponin content and therefore had good foaming index, haemolysis effect, and high crude saponin content. These herbs can be added as supplements to the herbal shampoos, so that the lathering is good without the addition of any chemical foaming agents.

The study of the prepared shampoos showed a combination of 10 herbs-*Emblica officinalis*, *Centella asiatica*, *Ocimum sanctum*, *Eclipta alba*, *Hibiscus rosa-sinensis*, *Acacia concinna*, *Sapindus laurifolius*, *Albizia amara*, *Azadirachta indica* and *Lawsonia inermis* had very good antilice property when extracted in petroleum ether. (Table:3)

From our study of the five shampoos –S1 to S5, the shampoo S2 was the best with good antilice effect. In this shampoo the lice lived for minimum time duration.

The final part of our study was to evaluate the five shampoos with the volunteers. This showed the shampoo S2 was good for both the antilice and also the antidandruff effect *in vivo*-as shown in the feedback analysis. The results showed that the shampoo S₄, with the three variables-*Annona squamosa*, *Vigna radiata* and *Camellia sinensis* had good functionality, performance and also a fairly good likeability aspect (Table 4a,b,c and Fig 3a,b,c). Hence these herbs could be used for good performance of soft, smooth, silky, and tangle free hair. Whereas the shampoo S₃, with the variable herbs- *Cymbopogon citrates*, *Camellia sinensis* and *Ficus bengalensis* good for the dandruff problem (Table 4d, Fig 3d). Since the different combination of herbs had different effects, we may conclude that the herbal shampoos could be developed for specific needs.

Though the liquid shampoos are easier to use, they require some preservatives. It is to avoid chemical preservatives that the shampoo preparation in this study was in powder form. While using the shampoo it could be soaked for a while in warm water, made into liquid form and then used. Since scalp is the

most absorbent part of the body, due to the large number of hair follicles, anything applied to the scalp goes directly to the blood, without being filtered. This is why it is important to use a completely herbal shampoo which is safer and without any side effects. There have been many studies on the comparison of herbal and synthetic shampoos and the studies have always been in favor of the herbal natural shampoos (Arora P *et al*2011)²⁴. Now that there has been a lot of awareness on the natural herbal cosmetics, the herbal products have an increased value.

From the feedback analysis, it is clear that the other aspects showed varied results and since for each aspect the preference was for a different shampoo, we may conclude that each of the shampoos prepared had its own added advantage over the other, hence for the preparation of the herbal shampoo the different herbs may be used and sold for the different effects it has, so that the consumer may pick up the shampoo based on their specific needs or the shampoo may be customized according to the specific needs of the customer. The most important aspect of this study has been to avoid totally the use of chemicals which even if used in minute quantities as they are harmful in the long run. Being natural is the secret of wellbeing.

This study further vouches the fact that the herbs are the safest and best in cosmetology. The studies of herbs in the field of herbal shampoos are many. One such interesting study on the molecular aspects of the effect of florets of *Carthamus tinctorius* on cell proliferation and hair growth by stimulating hair growth promoting genes (Junalatat J and Sripanidkulchai B, 2014)²⁵, further proves that these traditionally used herbs do have a stimulating effect, even at the molecular level.

CONCLUSION

In the present study an attempt has been made to bring out a wholly natural shampoo with no artificial colour or preservatives. For this we had to try the powder form of the shampoo since it has a longer

shelf life. Though the powder form is not very much preferred by the users, it was suggested that they make it into a paste before use, with warm water, to the desired consistency. This makes the washing easy and at the same time maintains the natural form of the herbs. To maintain a good lathering effect, the herbs with high saponin content were selected. The basic requirements were all present in the seven standard ingredients and only three variables were used in each of the five shampoos to check the minor differences these three herbs would bring about. The tests of antidandruff were done *in vivo* with the volunteers while the antilice were done *in vitro*. This was because getting volunteers for this aspect was difficult. From the feedback analysis it was seen that for the performance and functionality aspects the S₄ scored the best while likeability was maximum for S₅ and the antidandruff was best seen in S₃. The *in vivo* study showed that the shampoos had different effects so it may be concluded that the herbs have different effects and since the requirements of users differ it is better to have different herbal combinations suiting different type of hairs. In our study the shampoo with *Annona squamosa*, *Vigna radiata* and *Camellia sinensis* would be good for smooth and shiny hair, similarly a combination of *Cymbopogon citratus*, *Camellia sinensis*, and *Ficus bengalensis* would suit a person with dandruff problem, a combination of *Azadirachta indica*, *Ocimum sanctum* and *Lawsonia inermis* would be ideal to combat the lice problem in a natural way without affecting the hair quality.

ACKNOWLEDGEMENTS

I would like to thank and acknowledge the UGC for its financial grant in the form of Minor Research Project, also the MSc. Students, Shahana Firdouse and Manasi Kulkarni for the practical work and the Principal, Mount Carmel College, Autonomous, Bengaluru, for all the facilities provided.

Evaluation form –Herbal Shampoo**Name of the panelist:****Date:****Objective:** The objective of the study is to evaluate the likeability of the product attributes**Methodology:** Respondents are requested to wash the hair with the given shampoo. Evaluate the sensorial feel on the hair by using the rating scale given below.**Scale for product Attributes**

Scale	
1: Dislike it a lot	2: Dislike it a little
3: Neither like it or dislike	4: Like it a little
5: Like it a lot	

S.No	Product Attributes	Scale
Likeability in terms of		
1	Colour	
2	Texture	
3	Consistency	
4	Herbal que	
Performance aspects (in use)		
5	Foamability	
6	Mildness	
7	Cleansing effect	
8	Hair fall in use	
Functionality aspects (post use)		
9	Hair softness	
10	Hair smoothness	
11	Tangle free combing	
12	Shining of hair	
13	Silkiness of hair	
14	Moisturized feel	
15	Hair texture improvement	
16	Hair fall control	
Dandruff control aspects		
17	Reduction of itchiness	
18	Reduction in the flakes visually seen	

Share your experience as specific comments (positive / negative observations)

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Direction to fill the form:

Please go through all the parameters, understand the individual parameter and give the scale from 1-5. Thanks for your dedicated time and valuable feedback. We honour your valuable feedback for our improvement

Table 1
Foaming Index

S. No	Name of the Plant	Dilutions									
		1	2	3	4	5	6	7	8	9	10
1.											
2.	<i>Acacia concinna</i>	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
3.	<i>Sapindus laurifolius</i>	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
4.	<i>Centella asiatica</i>	0	0	0	0	0	0	0	0	0	0
5.	<i>Hibiscus rosa-sinus</i>	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
6.	<i>Eclipta alba</i>	0	0	0	>100	>100	>100	>100	>100	>100	>100
7.	<i>Trigonella foenum-graecum</i>	0	0	0	0	0	0	0	0	0	0
8.	<i>Terminalia bellarica</i>	0	0	0	>100	>100	>100	>100	>100	>100	>100
9.	<i>Terminalia chebula</i>	0	0	0	0	>100	>100	>100	>100	>100	>100
10.	<i>Embllica officinalis</i>	0	0	0	0	0	0	<100	<100	<100	<100
11.	<i>Cicer arietinum</i>	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
12.	<i>Vigna radiata</i>	<100	<100	<100	100	100	100	>100	>100	>100	>100
13.	<i>Punica granatum</i>	0	0	0	<100	<100	<100	<100	<100	<100	<100
14.	<i>Albizia amara</i>	>100	>100	>100	>100	>100	100	>100	>100	>100	>100
15.	<i>Azadirachta indica</i>	<100	<100	<100	>100	>100	>100	>100	>100	>100	>100
16.	<i>Lawsonia inermis</i>	0	0	>100	>100	>100	>100	>100	>100	>100	>100
17.	Green tea	0	>100	>100	>100	>100	>100	>100	>100	>100	>100
18.	Banyan roots	0	0	>100	>100	>100	>100	>100	>100	>100	>100
19.	<i>Annona squamosa</i>	0	0	0	0	0	0	0	0	0	0
20.	<i>Cymbopogon citratus</i>	0	0	0	0	0	>100	>100	>100	>100	>100
21.	<i>Ocimum sanctum</i>	0	>100	>100	>100	>100	0	0	0	>100	>100
22.	<i>Vitex negundo</i>	0	>100	>100	>100	>100	>100	>100	>100	>100	>100

Table 2
Fractional method of extraction of Saponin content.

S. No.	Name of the Plant	Crude Saponin weight (Grams)
1	<i>Acacia concinna</i>	0.08
2	<i>Sapindus laurifolius</i>	0.15
3	<i>Albizia amara</i>	0.77
4	<i>Vigna radiata</i>	0.25
5	<i>Azadirachta indica</i>	0.51

Table 3
Antilice activity.

S. No.	Name of the Shampoos	Number of hours taken for the lice to die	
		Petroleum ether extract	Aqueous extract
1	S1	26	48
2	S2	16.50	42
3	S3	18	45
4	S4	30	48.50
5	S5	20	44

Table 4 Survey of the Shampoos.

Table 4(a)
Likability aspects

Attributes	Likability aspects (Average)				
	S1	S2	S3	S4	S5
Dislike it a lot	5	1.25	1	0.25	0.25
Dislike it a little	1.25	1.5	3.25	3.5	2.75
Neither like it nor dislike it	6.05	3.5	6.25	2.75	3
Like it little	6	3.75	4.5	5	5.25
Like it a lot	3.25	2.25	2.75	5	6.25

Table 4(b)
Performance aspects

Attributes	Performance aspects (Average)				
	S1	S2	S3	S4	S5
Dislike it a lot	0	0.5	0.5	0.5	0.75
Dislike it a little	1.25	2	0.5	2.5	3
Neither like it nor dislike it	5.5	3.5	4.75	0.75	3
Like it little	7	4.5	8	5.25	5
Like it a lot	3.5	2.25	5.5	6.25	4.75

Table: 4(c)
Functionality aspects.

Attributes	Functionality aspects (average)				
	S1	S2	S3	S4	S5
Dislike it a lot	0	0.3	0	0.1	0.4
Dislike it a little	0.7	0.9	1.9	2.5	2.6
Neither like it nor dislike it	3.7	4.1	4.3	3.9	3.9
Like it little	5.5	3.3	4.9	6.1	4.7
Like it a lot	3.1	3.8	3.7	4.5	3.5

Table: 4(d)
Dandruff aspects

Attributes	Dandruff control aspects (Average)				
	S1	S2	S3	S4	S5
Dislike it a lot	0	0	0	0	1
Dislike it a little	0.5	0	1.5	5.5	3
Neither like it nor dislike it	7.5	1	2	1	0.5
Like it little	5.5	4.5	7	3.5	5.5
Like it a lot	4	8	8.5	3.5	4.5



Figure 1
Fractional method of extraction of Saponin content.

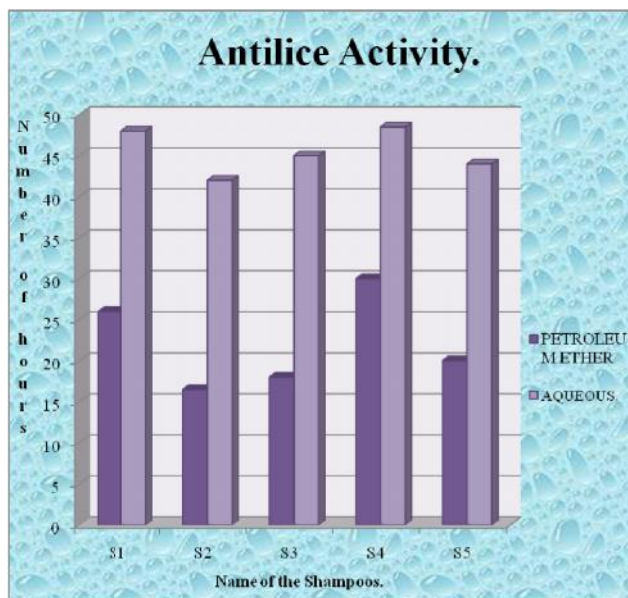


Figure 2
Antilice activity

Figure 3: Survey of the Shampoos

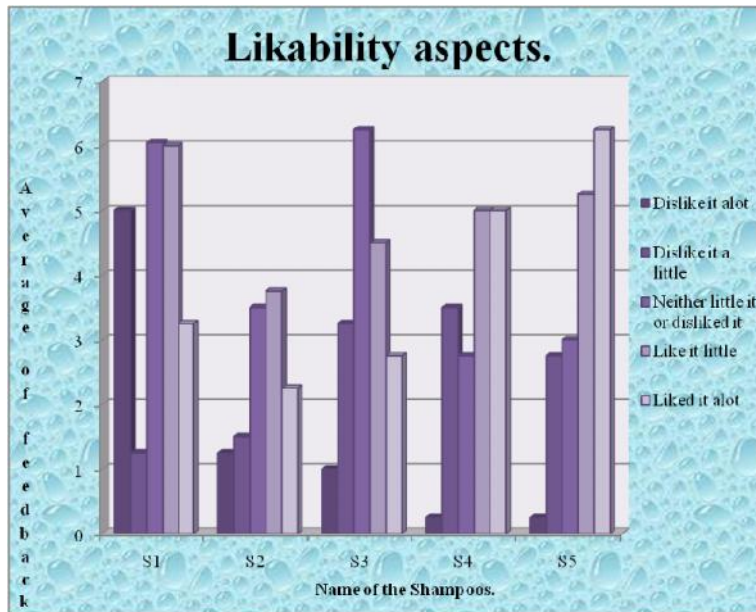


Figure 3(a)
Likability aspects

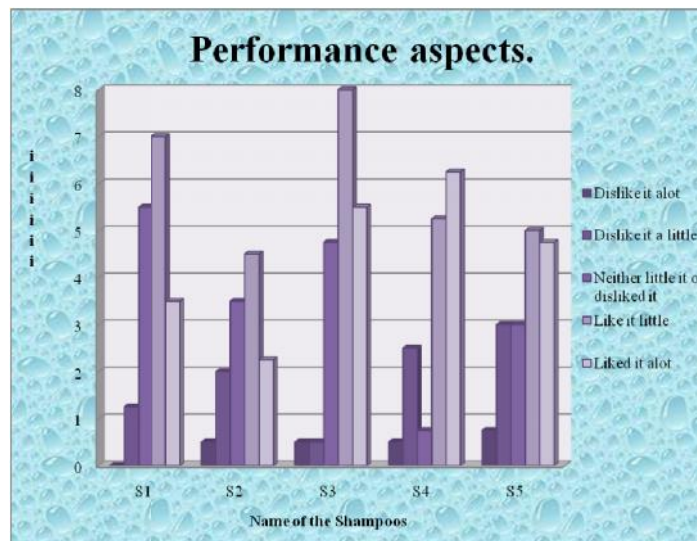


Figure 3(b)
Performance aspects.

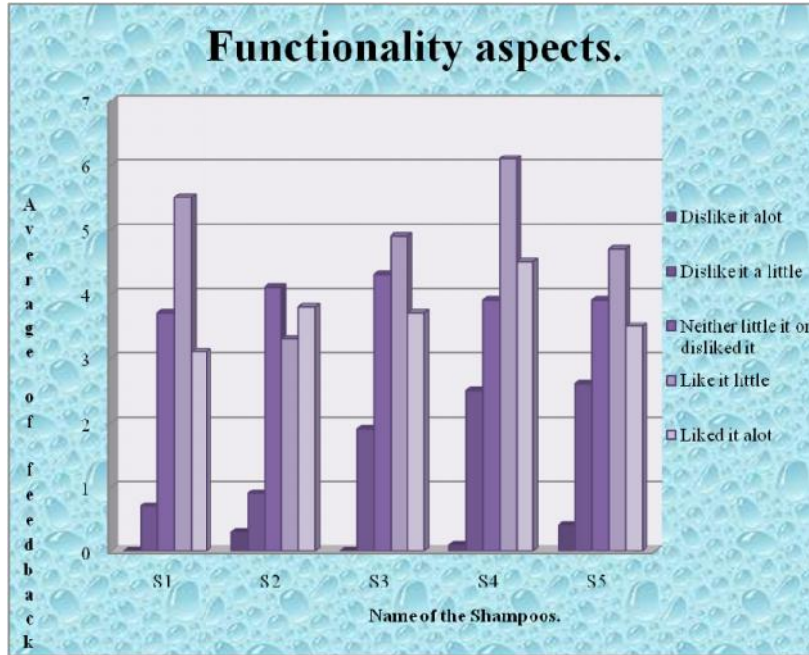


Figure 3(c)
Functionality aspects.

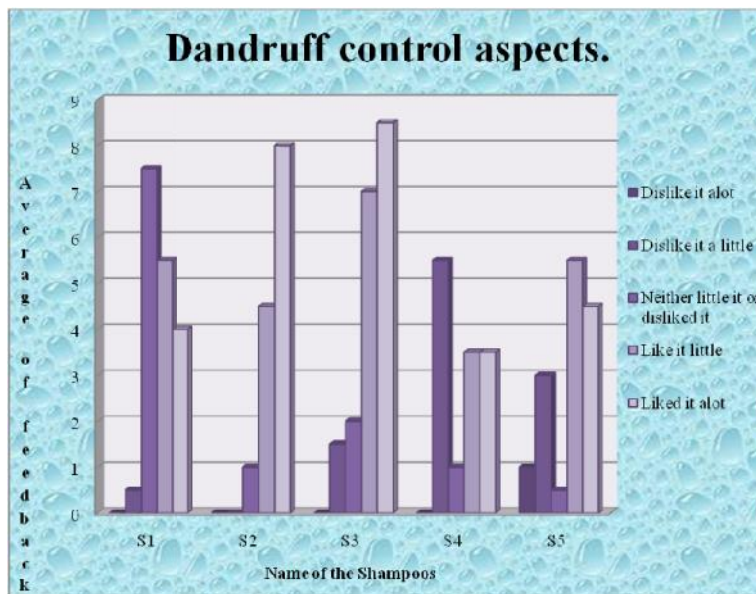


Figure 3(d)
Dandruff control aspects.

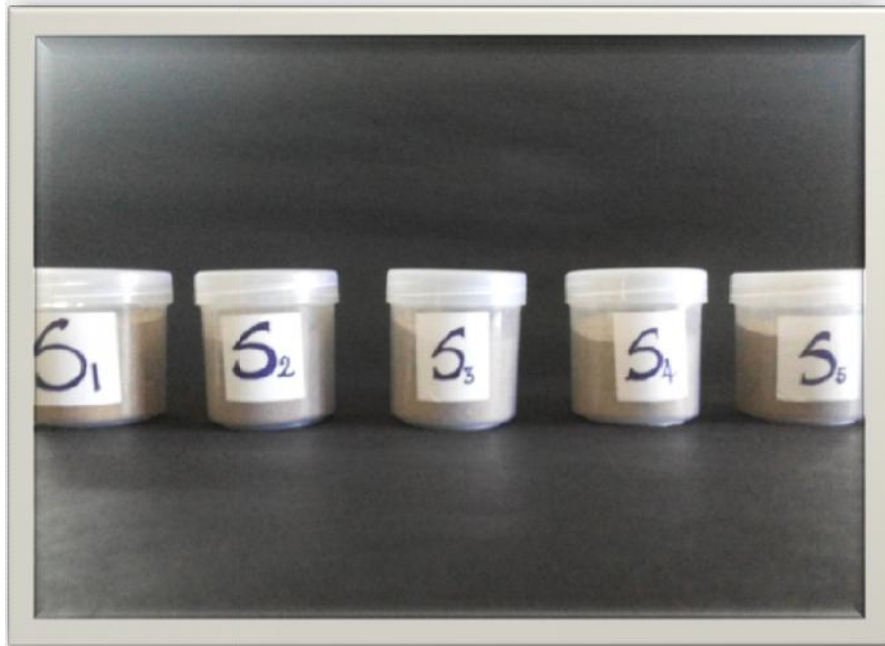


PLATE: 1
PREPARED SHAMPOOS

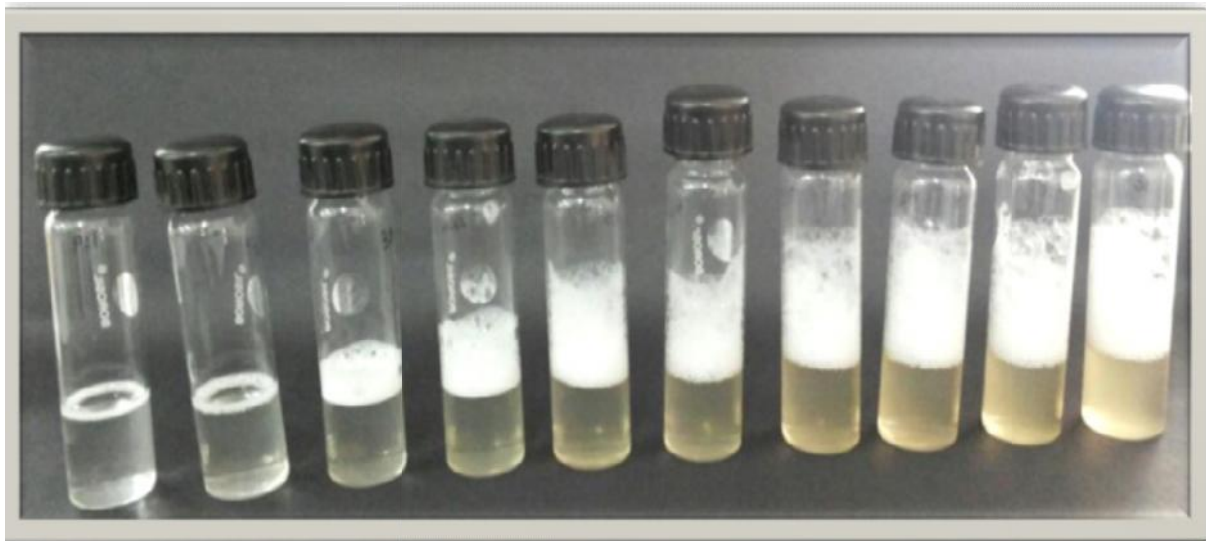
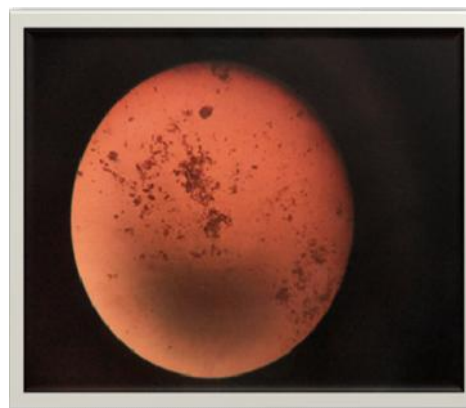


PLATE: 2
STUDY OF FOAMING INDEX

**BEFORE 2 HRS.****AFTER 2 HRS.****PLATE: 3
HAEMOLYSIS****PLATE: 4
STUDY OF ANTILICE ACTIVITY****REFERENCES**

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