



HERBAL INFUSED SHAMPOO: NATURALLY EFFECTIVE ANTI-LICE AND ANTI-DANDRUFF SHAMPOO

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Abstract:

The main aim of the study was to formulate and evaluate a herbal shampoo showing anti lice effect consisting of natural ingredients which will reduce the side effects caused by the chemical ingredients. The aim was to substitute the harmful synthetic chemical ingredients with all natural and safe plant extracts. The shampoo is enriched with the herbal extracts such as Quassia amara, Custard apple (*Annona squamosa*) and Pyrethrum (*Chrysanthemum cinerariifolium*). These were the main ingredient which shows the anti lice activity by killing all the generations of lice i.e. nits, nymphs and adult lice. Reetha (*Sapindus mukorossi*) extract was also used which shows anti dandruff effect and also used as foaming agent and conditioner. The physicochemical properties of the herbal shampoo were tested such as physical appearance, pH determination, foaming ability, amount of solid content, etc. The shampoo shows good cleansing property, low surface area, good foam stability and good antidandruff property. The results indicated that this shampoo can be a potential alternative for managing head lice and dandruff in a natural and effective way instead of synthetic chemical shampoos.

Keywords: Herbal shampoo, Herbal extract, anti-lice, anti-dandruff.

INTRODUCTION

SCALP:

The scalp is that part of the human head that extends from the super ciliary arches anteriorly and external occipital protuberance and superior nuchal lines posteriorly. Laterally it continues inferiorly to the zygomatic arch.

- **Skin** : The skin is the outermost layer of the scalp. Structurally it is very similar to skin throughout the body with the exception that hair is present on a large quantity of it.
- **Connective tissue (dense)** : Dense connective tissue is deep to the skin. This layer anchors the skin till the third layer and contains the arteries, veins, and nerves supplying to the scalp. When a cut is made on scalp, the dense connective tissue surrounding the vessels tends to carry cut vessels open. This results in profuse bleeding.
- **Aponeurotic layer:** The deepest layer of the primary 3 layers is the aponeurotic layer. Securely attached to the skin by the dense connective tissue of the 2nd layer, this layer comprises of the occipitofrontalis muscle.
- **Loose connective tissue:** A layer of loose connective tissue separates the aponeurotic layer and the pericranium. It supports movement of the scalp proper over the Calvaria. Due to its consistency, infections tend to localize and it spread through the loose connective tissue.
- **Pericranium:** It is the deepest layer of the scalp and is the periosteum on the outer surface of the Calvaria. It is connected to the bones of the Calvaria, but is removable, except in the area of the sutures.(1)

LICE AND NITS

Lice have six jointed legs with specially developed claws for latching onto hair, and they are flattened dorso-ventrally, or top to bottom. They can easily migrate from hair to hair, but they excel at adhering to avoid being dislodged. Head lice with red colouring have probably just fed. They could be quite challenging to see on someone's head due to their small size, flattened bodies, and colour. The louse then feeds similarly to a mosquito by sticking its "straw-like" mouthparts into a blood artery. The itching and scratching that are indicative of an infestation might develop over time as a result of this feeding activity irritating the skin. Every day, a louse can consume many blood meals.

Head-lice Life Cycle:

- **Nits/Eggs:** As "nits," or eggs, head lice begin their lives. An average of five eggs may be laid each day by the female adult head louse. 4 Eggs are joined individually to a hair shaft using a "glue" that is impervious to both chemical and mechanical removal.
- **Nymphs:** The newly hatched nymph will instantly begin to crawl and look for a spot to feed. Three nymphal stages are separated by moulting, which is the removal of the exoskeleton or "skin." There are three nymphal phases roughly 8–12 days.
- **Adults:** In the adult stage, which follows the last moult, sexual maturation and the cessation of body growth, respectively. Every three to six hours, adult head lice still need to eat blood to survive. Head lice have distinct sexes, and in order for females to produce viable eggs, they must mate and be fertilized. A mated female can keep making eggs for as long as she lives, which is roughly 30 days. During this time, she can produce an average of five eggs every day.(2)

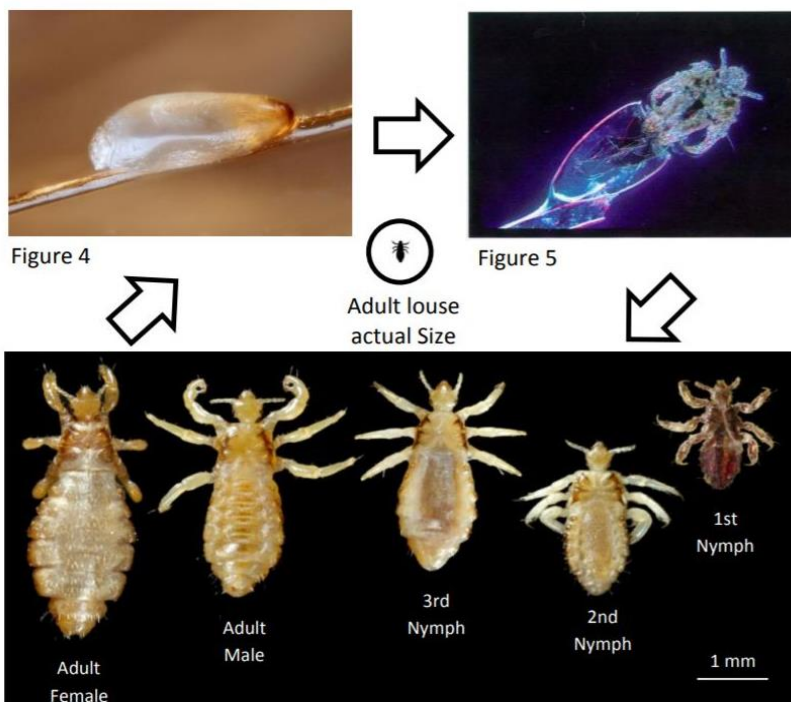


Figure 4

Figure 5

Figure 6

Image: Centers for Disease Control/James Gathany

Head lice-Life cycle

DANDRUFF

Dandruff is a common scalp disorder affecting almost half of the population at the pre-pubertal age and of any gender and ethnicity. Dandruff affects aesthetic worth and dandruff can also cause itching. The severity of dandruff might fluctuate with season as it typically worsens in winter. A group of corneocytes that have maintained a high level of intercellular cohesion make up dandruff scale. Scale size and abundance vary from one location to a different and across time. The scalp form as biocenose for various organisms such as Staphylococci and Propionibacterium. It is commonly known that dandruff has non-microbial causes. Desquamation of the scalp is a known side effect of prolonged exposure to sunshine.

Dandruff is partially brought on by minor scalp irritation brought on by excessive shampooing, frequent brushing, use of specific cosmetic products, and exposure to dust and grime. Dandruff is caused by the hyperproliferation of keratinocytes, which leads to a dysregulation of keratinization. Large flakes of dermis are produced as the corneocytes group together.(3)

LITERATURE REVIEW

Head Phthiraptera in paediatric patients: prevention and treatment

Author:- Kosta Y. Mumcuoglu

The louse comb is one of the best tools for preventing and controlling lice. It can also be utilized to treat infestations, determine whether pediculicide therapy has been effective, and eliminate nits (dead eggs or egg shells) The child's scalp should be examined 10 days after taking medication with any anti louse product. Treatment should stop if no active lice are detected.

Development of a herbal shampoo to combat head lice (*Pediculus humanus* De Geer)

Author:- Deeksha et al

Natural herbal shampoos contain herbs without any negative side effects. Nine formulations were created and assessed using several criteria, including viscosity, surface tension, and foam. For all formulations, the Lethal Time for head lice mortality was determined to be between 7.5 to 52.5 minutes. Each and every shampoo formula displayed high quality and was safe to use.

Creation and assessment of a herbal anti-dandruff shampoo

Author:- Revansiddappa M et al

The main goal of this study was to swap safe natural chemicals with dangerous synthetic ones in anti-dandruff shampoo composition. Ritha fruits, liquorice stolons, Bengal gramme seeds, Brahmi leaves, Pomegranate seeds, Hibiscus leaves, Marigold flowers, and Lemon fruits with all component extract were used to make herbal shampoo. Multiple surfactants were included in the formulation, which had a 33.22 percent cleaning activity. The combination of shikakai and licorice may be the cause of the formulation's greater foaming ability.

The creation and assessment of an herbal shampoo

Author:- Pratiksha Sankpal

The aim of this study is to create and formulate a herbal shampoo, evaluate its physiochemical function, and eliminate dangerous synthetic ingredients in favour of safe natural ones. *Embllica officinalis*, *Hibiscus rosa-sinensis*, *Acacia concinna*, *Sapindus indica*, *Eclipta prostrata*, *Aloe barbadensis*, and *Cassia auriculata* extracts are used to make shampoo in various ratios. The cleaner that was developed was attractive and transparent, with small bubble size, minimal surface strain, and effective conditioning were all well executed. Additional work was needed, nevertheless, to enhance its performance, quality, and safety.

Azadirachta indica and *aegle marmelos*: phytoconstituents analysis and anti-head lice activity

Author:- Aathira E. P. et.al

The development of new, effective medications for modern medicine depends significantly on medicinal plants. *Aegle marmelos* and *Azadirachta indica* are two plants in the Rutaceae family whose leaves were examined for their phytochemical analysis and anti-head-lice impact. Phytochemicals are substances that are naturally found in plants and don't have any negative side effects like pharmaceutical chemicals. These include alkaloids, saponin, terpenes, amino acids, starch, proteins, and carbohydrates. Head lice are resistant to chemical shampoos and pediculicides despite the fact that they are bad for hair.

Dandruff and Seborrheic Dermatitis: A Comprehensive Review

Author : Luis J. Borda et.al

The same condition that affects the seborrheic parts of the body, SD, also causes dandruff. Dandruff only affects the scalp and is characterised by itchy, flaky, or scaling skin, irritation, and pruritus. The pathogenesis may be influenced by a number of intrinsic and extrinsic variables, including *Malassezia* yeast and host epidermal conditions.

Hair's physiology and anatomy**Author:** M.R. Harkey

Hair is a strong, biochemically inert substance that develops from tiny organs made up of remarkably similar cell types. Despite having what could seem to be a straightforward structure, hair is actually a complicated component of the anatomy whose biochemistry is still little understood. The benefits and drawbacks of utilising pubic, beard, or scalp hair as test subjects for hair analysis are also taken into account.

As possible pesticides for eradicating human head lice, plant extracts and their constituents**Author:** Carmen Rossini et.al

The head lice, *Pediculus humanus capitis* (Phthiraptera:Pediculidae), is an obligate ectoparasite of humans. It causes pediculosis capitis, a nuisance for millions of people worldwide, with high prevalence in children. Natural products from plants, especially essential oils (Eos), are good candidates for safer control agents that may provide good anti-lice activity and low levels of evolved resistance.

Annona squamosa (L) leaf extracts' phytochemical analyses and antibacterial properties**Author:** Neethu Simon K et.al

Annona squamosa (L) is rich in phytosterols, alkaloids, oils, saponins, phenols, and flavanoids. It is employed as an anti-inflammatory, anti-lice, anti-tumor, hepatoprotective, cytotoxic, genotoxic, and other therapeutic agents. The antimicrobial activity against certain pathogens was proven by the presence of a variety of secondary metabolites. Focus in the latter has been on toxicity against adults, nymphs, and a small amount against nits.





AIM OF RESEARCH WORK

The goal of the research is to create an efficient anti-lice shampoo that may be more effective and have a better action potential as a result of the introduction of one or more extracts in an optimized condition that provide complementary healing and a soothing effect to the scalp after damage caused by an adult lice.

OBJECTIVE AND SCOPE OF RESEARCH WORK

1. To prepare a combinational herbal treatment in a form of a shampoo to treat the infective lice and nits.
2. To treat the inflammation, itching and flaking in the scalp caused by the Lice.
3. To prevent hair loss and hair damage caused due to the weakening of the root follicles.
4. To prevent transmission of disease (epidemic typhus, Bartonella quintana infection, and epidemic relapsing fever).
5. Pediculosis usually cause itchy skin and a skin rash at the site of louse bites, thus an Pediculositic shampoo is a must to eradicate lice and to destroy their nits from the scalp.
6. The antidandruff action of the herbal extracts in the shampoo prevents the flaking effect and reduces the damage of the scalp and hair.
7. Side effects might be present that is near to the null and better action of potential than synthetic formulations.

PLANTS USED IN THE FORMULATION

S. No.	Plant Name	Medicinal Use	Figure
1	Quassia Amara (Amargo) (4)	Anti-lice, Anti-malarial, Amoebicide	
2	Reetha (Sapandus Mukorossi) (5)	Anti-dandruff, Anti-fungal, Anti-bacterial	
3	Pyrethrum (Chrysanthemum cinerariifolium) (5)	Pediculicidal, Insecticidal, Anti-fungal	
4	Custard Apple (Annona Squamosa) (6)	Anti-lice, Anti-inflammatory	

EXTRACTION OF THE PLANTS USED**QUASSIA AMARA:(7)**

The hydroalcoholic extract was prepared by first drying the Quassia powder (30g) at 60° C in an Hot Air Oven for 20 minutes, ground and placed in 70% methanol (300ml) in a suitable flask for 48h. The pooled extracts were filtered through a Whatman No. 1 filter paper by using a vacuum pump filter and it's further concentrated at 40°C using a Electrical Thermostatic Water Bath for 30 minutes. The final concentrated filtrate was collected in a suitable flask.

**Hydroalcoholic extract****Filtered Extract****Preparing Concentrated QUASSIA Extract by the use of Electric Water Bath****PYRETHRUM:(8)**

A quantity of 30 grams of dry flowers were soaked in a mixture consisting of 80 ml of Ethanol, 80 ml of Acetone and 80 ml of Petroleum ether for 3 days in shadow. Then the mixture of solvents and flowers was filtered using filter paper (Whatman filter paper no. 1), and the filtrate was mixed with Methanol 80% at a ratio of 20:80 (extract: alcohol). The mixture was shaken vigorously and left to settle in order to be separated into two layers. The layer tend to yellow color which contain the Pyrethrin was isolated. The solution was concentrated by using an appropriate technique.

**Soaked mixture of pyrethrum dry Flowers****Yellow Pyrethrin layer****REETHA:(9)**

The pericarp of the Reetha fruit (*Sapindus mukorossi*) which acts as the main source of the extract was isolated by removing the seeds from the fruits.

The pericarp was then dried at 60 °C in an oven for 4 days. Dried pericarp was ground into a fine powder.

The powder was then boiled in water for 40-45 minutes over the burner.

The mixture was then cooled off and vacuum filtered.

The extract is then collected and stored.



Filtered Reetha extract



Reetha extract after boiling

SITAFAL

A quantity of 30 grams of sitafal seed powder was measured.

It is macerated into 70% methanol (200ml) in a suitable container for 2 days.

It was run for 6hours at 60 °C on the Soxhlet apparatus.

The sitafal extract was then let to cool and stored.



Extraction of Annona squamosa by Soxhlet apparatus

FORMULATION INGREDIENTS AND THEIR PURPOSES

INGREDIENTS	PURPOSE IN FORMULATION
Coco amido propyl betaine (CAPB)	Foam booster, Surfactant and Thickener
Coco glucoside (an alkyl glucoside)	Cleanser, Natural Surfactant and Stabilizer
Sodium Lauryl Sulphate(anionic surfactant)	Surfactant

Ethylene glycol monostearate	Pearlescent agent, Emulsion Stabilizer
Coco monoethanolamide	Emollient, Foam Stabilizer
Sodium Gluconate	Sequestrant, Natural preservative
Sodium Benzoate	Antimicrobial Agent
Methyl paraben	Preservative
Propyl paraben	Preservative
Sodium Chloride	Thickener
Xanthan Gum	Viscosity Builder, Stabilizer
Carbopol 940	Texture Enhancer, Viscosity Builder, Stabilizer
Tocopheryl acetate	Anti-oxidant, Anti-inflammatory

METHOD OF PREPARATION

STEP 1:

- The extracts of Quassia, Sitaful, Reetha, and Pyrethrum are mixed together in a suitable flask in the given quantity.
- The sodium lauryl sulphate(SLS) aqueous solution is prepared in a beaker (1); thereafter, the given quantity of Ethylene glycol monostearate (EGMS) is added to the aqueous solution of SLS by applying continuous heat to enhance the solubility of EGMS.
- A suitable amount of sodium chloride is added to the beaker(2) containing the given amount of coco amido propyl betaine solvent, and some heat is provided to ease the dissolution of NaCl to form a stable solution.

STEP 2:

- The organic dissolution of methyl and propyl parabens is prepared in ethanol and kept separate for further use.
- The viscous aqueous solution containing finely powdered sodium gluconate is dissolved in a sufficient amount of water and prepared for further use.

STEP 3:

- After a slight cooling of the solutions prepared in Step 1, the contents of beaker 1 are transferred to the viscous solution in beaker 2, along with the given amount of coco glucosides, and continuous stirring is applied.
- The flask containing the extracts mixture is poured into the mixture of the above solution while slowly and continuously adding the given amount of coco monoethanolamide and applying continuous stirring to the mixture until a stable foaming solution is prepared.

STEP 4:

- The given amount of preservatives solution and sodium gluconate solution prepared in step 2 is added to the foaming solution in a stepwise order, along with some quantity of sodium benzoate, to form the final solution.

STEP 5:

- The given amount of oily Tocopherol acetate is added to the final solution along with some coco monoethanolamide and stirred continuously until the pearling effect is obtained.

STEP 6:

- To avoid lump formation, a viscous solution of Carbopol 940 or Xanthan gum is passed through sieve of mesh 40.
- The above viscous final solution is made up to 50 mL with quantity sufficient purified water, and the shampoo is prepared.

EVALUATION PARAMETERS**I) Phytochemical test of extract:****Quassia(triterpenoids): (10)**

TEST	PROCEDURE	OBSERVATION
SALKOWSKI TEST	Extract+ Concentrated sulfuric acid	Yellow color at the bottom indicates the presence of triterpenoids

Reetha:(11)

TEST	PROCEDURE	OBSERVATION
SAPONIN	1 mL of extract was diluted with distilled water up to 3 mL. The suspension was then shaken in a test tube for 15 min	Formation of a two layer of foam indicated the presence of saponin.

Pyrethrum:(12)

TEST	PROCEDURE	OBSERVATION
Triterpenoids	To 3 ml of flower extracts + piece of tin +2 drops of thionyl chloride	Formation of violet or purple colour indicated the presence of triterpenoids

**II) EVALUATION TESTS FOR ANTI-LICE SHAMPOO:**

1. Physical appearance: The prepared herbal shampoo was evaluated for physical characters like color and odor.

Colour	Light green
Odour	Pleasant smell
Appearance	Clear and viscous



Physical appearance

2. Determination of pH:(13)

1ml of prepared shampoo were diluted with 10ml of distilled water and the pH of shampoo was estimated using pH paper at room temperature.

By pH paper



By pH meter:



SAMPLE	By pH paper	By pH meter
Shampoo	5	5.50

3. Surface tension:(14)

Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chromic acid and purified water. Because surface tension is highly affected with grease or other lubricants.

- 1) Weight of Empty beaker = 26.82
- 2) Weight of beaker with 20 drops of water = 29.87
 - W1(Difference between 2 and 1) : 29.87-26.82=3.05g
- 3) Weight of beaker with 20 drops of diluted shampoo solution =27.54
 - W2(Difference between 3 and 2) : 27.54 -26.82 = 1.08

By using surface tension formula,

Surface tension of shampoo=W2/W1*72(Surface tension of water)

- Surface tension of shampoo= 1.08/3.05*72
= 25.94 dyne /cm

4. Foaming ability and foam stability:(15)

At room temperature, 1% of 50 mL of the shampoo solution was put into a 250-mL graduated cylinder, which was then covered by hand and shaken ten times. The total volume of the foam content after 1.0 min of shaking was recorded. The height of the foam generated was measured immediately.

Amount of Shampoo Taken: 1% of 50 ml

Foam produce before shaking	1.1cm
Foam produce after shaking	8.6cm



5. Dirt Dispersion:(15)

1 g of sample in 100 mL of water was taken and one drop of India ink was added; the test tube was stoppered and shaken ten times. The amount of ink in the foam was estimated as none, light, moderate, or heavy.



The dirt detergency activity of shampoo was found to be moderate.

6. Amount of solid content (14)

A clean dry evaporating dish was weighed and added 3 g of shampoo to the evaporating dish. The dish and shampoo was weighed. The exact weight of the shampoo was calculated (only solids) and evaporating dish with shampoo was placed on hot plate until the liquid portion was evaporated. The weight of the shampoo (only solids) after drying was calculated.

Weight of empty plate = 44.04

Weight of plate containing shampoo before drying = 47.42

Weight of plate containing shampoo after drying = 44.52

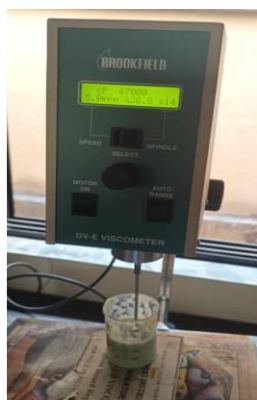
= 47.42 – 44.52

= 2.9g

Amount of solid content in shampoo = 2.9g

7. Viscosity (15)

The viscosity of the tested shampoos was determined using the Brookfield Viscometer (R/S plus rheometer model, LV, USA) set at different spindle speeds of 5, 20 and 50 rpm



At 5 rpm



At 20 rpm



At 50 rpm

Result and Discussion

Four formulations (F1 to F4) were prepared using the extracts and the excipients. The composition of the excipients were altered to some extent. These formulations were prepared by mixing using ascending order and by continuous trituration. These formulations were evaluated organoleptically and it was observed that these formulations differ in their viscosities and color to some extent. General

characteristics like pH, foam ability, solid content were found to be identical. The formulation with the desired viscosity and color was selected.

Present investigation were carried out to formulate a herbal shampoo with traditional herbal knowledge and also to develop some of the parameters for quality and purity of herbal shampoo. Even though these studies are preliminary but the presented evaluation tests will be useful for further standardization of herbal shampoo for anti-lice and anti-dandruff properties.

CONCLUSION

The aim of this study was to formulate a herbal shampoo that consists of more than 90% herbal ingredients that possess anti lice and anti-dandruff properties. We formulated a herbal shampoo by using plant extracts which are traditionally used for hair cleansing, anti-lice and anti-dandruff therapeutic activities. All the ingredients used to formulate shampoo are safer than the synthetic shampoos available in the market that contains several harmful chemicals like silicones and others. Several tests were performed to evaluate and compare the physicochemical and pharmaceutical properties of prepared herbal shampoo.

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