

Preparation of Anti-Dandruff Shampoo By Agitation Method

Athulya Anil*¹, Ayisha I*², Prasanth TA*³, Prasobh GR*⁴

*^{1,2,3} B Pharm Student Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India, 695502.

*⁴ Principal, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India, 695502.

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ABSTRACT: Now a days dependency of people is rising on herbal preparations and cosmetics due to safe and minimal side effects. In today fast life people also face hair problems like dandruff hair fall white hair splitty end hair etc. The cause of hair problem may be tension, scalp infection, low vitamin, food minerals and high chemical containing shampoo. In case of hair disorder like dandruff problem, proper selection of actives such as antifungal or anti-microbial agents their required amounts, dosage form can be formulated as shampoo to fight against dandruff. This article aims to formulate shampoo containing some actives such as stearic acid and sulphur powder use to treat the dandruff. The formulation at laboratory scale was done and evaluated for number of parameters to ensure its safety, efficacy and stability.

Key words: SLS – Sodium lauryl sulphate FDA – Food and drug administration P^H-Potential of hydrogen

I. INTRODUCTION

Dandruff (**Pityriasis capitis**) is a common condition, in which it is a non-inflammatory form of seborrheic dermatitis, with increased scalp scaling, non-contagious hair problem, nearly affecting person irrespective of age. It may be dry or greasy, dry dandruff appears silvery and white while greasy flakes appear pale yellowish and may have an unpleasant smell. There are several types of dandruff, knowing which type of dandruff you have is key to getting rid of the flake and itchiness. Some types of dandruff are dry skin dandruff, oily skin dandruff, fungus related dandruff, Disease related dandruff. The excessive shedding of dead skin cell from scalp is may be caused by fungus called *Malassezia restricta* and *Malassezia glossa*. *Malassezia* also called *pityrosporum* is a yeast causing infection of skin and scalp.

The hair follicle is one of the characteristic features of mammals serves as a unique miniorgan.

In humans, hair has various functions such as protection against external factors, sebum, apocrine sweat and pheromones production, and thermoregulation.

The hair follicle serves as a reservoir for epithelial and melanocyte stem cells, and it is capable of being one of the few immune privileged sites of human body. Hair follicle development is related to the interactions between epithelial and mesenchymal cells.

II. CAUSES & SYMPTOMS:

Those shiny white flakes that you often brush off your collar and shoulders are probably because of a skin condition called Dandruff. It looks harmless but dandruff causes itch and embarrassment. It is a very common condition that is responsible for the constant flaking of scalp skin

1. Irritated and oily skin
2. Not maintaining clean hygiene and not shampooing enough, as it causes skin cells to accumulate and create flakes and itching.
3. A reaction of our immune system to a type of yeast that lives on the skin called a *Malasseziaglobosa*.
4. Hormonal issues may be involved because dandruff is most found after puberty in young adults.
5. Sensitivity to hair care products (contact dermatitis).
6. The signs and symptoms may be more severe if you are stressed, and they tend to flare in cold, dry seasons.
7. A red rash due to the itching can also be seen around the scalp, forehead, and ears or forehead that if you are suffering from dandruff

III. NORMAL HAIR GROWTH CYCLE

The approximate growth of hair is 10 cm per year. Hair follicle undergoes three phases of growth in a cyclic manner.[5] Hair is one of the

vital parts of the body derived from ectoderm of skin, is protective appendages on the body and considered accessory structure of the integument along with sebaceous glands; sweat glands and nails.

a) Anagen

It is growth phase which may vary from 2 to 8 years and determines the length of the hair.

b) Catagen

It is transitional or regression phase which lasts about 10 days. At the end of the growth phase, the

hair enters into this phase. The hair follicle shrinks and detaches from the dermal papilla.

c) Telogen

It is known as resting phase, which lasts about 5–6 weeks. This phase comes after the transitional phase. The hair follicle along with the dermal papilla remain in the resting phase. Both of them join and new hair growth begins at the end of this stage. This new hair pushes the old one enters in the growth Phase again.



Now a days commonly anti-dandruff shampoo is used for prevention and treatment of dandruff.

[10] Shampoo is mainly based on synthetic or herbal ingredients. A shampoo is a preparation of surfactant in liquid, solid or powder, it removes grease, dirt and skin debris from the hair and scalp without adversely affecting the user. The ideal properties of shampoos are it should be effectively and completely removed excess sebum and other fatty substance and remove dust or soil, and loose corneal cells from the hair. In the early days a shampoo could be defined as an effective cleansing agent for hair and scalp but today the shampoo must do much more. It must leave the hair easy to comb, lustrous and controllable whilst being convenient and easy to use.

Dandruff occurs mainly between puberty to middle age, when sebaceous glands are most active. Malassezia formerly called Pityrosporum is a yeast causing infection of skin and scalp. It often causes itching. Warm and humid atmosphere, overcrowding, and poor personal hygiene are ideally suited for the growth of Malassezia. Dandruff affects 5% of the population and mostly occurs after puberty, between 20 and 30 years and

dandruff affect males more than females. Dandruff occurs exclusively on skin in areas with high levels of sebum. Symptoms of dandruff mainly include itching, flakes, and redness of scalp. Dandruff can be treated in two ways, using herbal-based anti-dandruff shampoo and using chemical-based anti-dandruff shampoo. [3] The cause of dandruff varies among individuals depending on their susceptibility. Mainly the causes can be divided in to microbial and non-microbial factors.

a) NON-MICROBIAL FACTORS:

- Dry scalp
- Damage to the scalp stratum corneum
- Oily or irritated skin
- Individual susceptibility to oleic acid
- Sensitivity to hair cosmetics
- Other scalp condition like Psoriasis, eczema etc.

b) [3] MICROBIAL FACTORS:

The fungi Malassezia cause dandruff by either or both of the following mechanism

- The fungi Malassezia stimulates the enzyme lipase on the scalp. The enzyme causes

oxidation of try glycerides of sebum to produce unsaturated and saturated fatty acids. The saturated fatty acids are consumed by the fungi for self-proliferation and growth unsaturated fatty acids include oleic acid and arachidonic acid, oleic acid is an irritant for human skin while arachidonic acid is responsible for potentiating the inflammatory responses. Hence the result of the degradation of the fatty acids is scalp skin irritation, inflammation and fungal growth. These further cause dry flakes called dandruff.

The fungi cause dandruff by other mechanism is altering the normal shedding of dead skin cells. [3] Few enzymes on scalp eat up connections between dead skin cells to Slough them individually. The fungi modify this function

of enzymes and inhibits cutting of the connections. This leads to aggregation of corneocytes that shed off in clusters, leading to visible white flakes

[11] Shampoos are the formulations are used to clean the dirt of scalp and other environmental pollutants, sebum, sweat, desquamated coenocytes and other greasy residues from scalp. The main aim of shampoo should be to develop a shampoo which removes only the right amount of sebum while leaving sufficient number of conditioning agents. [4] Surfactants are amphiphilic in nature, that is they have hydrophilic head and hydrophobic tail. The lipophilic end is used to bind sebum and oily dirt while the hydrophilic end binds to water, thus allowing removal of sebum with water.

IV. MATERIALS AND METHODS

The ingredient used in the anti-dandruff shampoo is

SL NO:	INGREDIENTS	BENEFITS
1.	Sulphur powder	Anti-dandruff agents
2.	Sodium lauryl sulphate	Surfactant
3.	Stearic acid	Anti-fungal agents
4.	Tragacanth	Thickening, strengthening and volumizing properties
5.	Sodium hydroxide	Adjust the pH
6.	Perfume	Mask the unpleasant aroma
7.	Preservatives	Prevent contamination

The anti-dandruff shampoo is prepared by agitation method: The anti-dandruff shampoo is prepared by Agitation method by using stirrer. Agitation is referring to putting into motion by shaking or stirring, often to achieve mixing. Vigorous agitation of liquids, particularly water, will cause a reduction in the agglomeration of the liquid and change its normal properties. The anti-dandruff agents used in this study are sulphur and stearic acid. Sulphur is an FDA approved ingredient used in common OTC products to treat dandruff. The other ingredient include sodium lauryl sulphate (SLS) is a surfactant, trapping oil and dirt in hair. Tragacanth has strengthening, volumizing and conditioning properties. Sodium

hydroxide is used for adjust the pH of the formula. Then perfume and preservatives are used for mask the unpleasant aroma and prevent contamination during formulation, shipment, storage or consumer use and also prevent alteration caused by microorganisms.

V. INGREDIENTS

Sodium lauryl sulphate: Anionic surfactants are mostly used because of good foaming properties. The hydrophilic portion carries a negative charge which results in superior foaming, cleaning and end result attributes. In this formulation sodium lauryl sulphate is used as surfactant.

Non -ionic surfactants have good cleansing properties but do not have sufficient foaming power. Cationic surfactants are toxic and are hence not used. However, they may be used in low concentration in hair conditioners. Ampholytic, being expensive, are generally not used. However, they are mainly used as secondary surfactants and good hair conditioners.

Sodium lauryl sulphate (SLS), also known as sodium laurilsulfate or sodium dodecyl sulphate, is an anionic surfactant. It lowers the surface tension between ingredients.

Stearic acid:[15] According to chemistry, stearic acid has an 18-carbon chain, and also called octadecanoic acid; it is so referring to as long chain fatty acid. The stearic acid has antibacterial and antifungal action.

Sulphur: [13] Sulphur is an ingredient of various cosmetics preparations for its keratolytic, antifungal, and antibacterial properties. The most commonly used form of pharmaceutical sulphur is octasifur.

Topically it is indicated for dandruff, acne, scaly and red skin patches (seborrheic dermatitis). Sulphur acts as a keratolytic agent and also it has

antibacterial activity. It also kills fungi, scabies mites and other parasites.

Sodium hydroxide: Sodium hydroxide or ‘lye ‘is a strong alkali. Sodium hydroxide has three main roles; As a precursor to the main ingredients (e.g.; sodium lauryl sulphate), To reduce the acidity, so the shampoo doesn’t damage hair, as a relaxer to help straighten hair.

Tragacanth:[14] Tragacanth Gum, is the dried gummy exudation obtained by incision from "Astragalus Gummifer" and is known in commerce as Persian tragacanth. Tragacanth shampoo protects the natural beauty of your hair, and leaves it soft and silky. It makes the hair thicker and gives it manageability. pH- Balanced formula promotes healthy hair. The natural tragacanth extract in this shampoo increases hair shine and elasticity and makes hair healthy. By using Tragacanth Shampoo, you won't need a separate conditioner.

Preservatives: Preservatives are added to prevent the contamination. Methyl paraben is used as preservatives.They prevent harmful mould, bacteria, and fungi from infecting your products. This helps protect you from infections.Methylparaben was not toxic in moderate to high doses.

VI. FORMULATION TRIAL :01

SL.NO	INGREDIENTS	QUANTITY
1	Sodium lauryl sulphate	5g
2	Stearic acid	1.4g
3	Tragacanth	0%
4	Sodium hydroxide	0.2g
5	Sulphur powder	0.4g
6	Water	20ml
7	Perfume	5ml
8	Preservative	1g

TRIAL :02

SL.NO	INGREDIENTS	QUANTITY
1	Sodium lauryl sulphate	5g
2	Stearic acid	1.4g
3	Tragacanth	0.2%
4	Sodium hydroxide	0.2g
5	Sulphur powder	0.4g
6	Water	20ml
7	Perfume	5ml
8	Preservative	1g



TRIAL :03

SL.NO	INGREDIENTS	QUANTITY
1	Sodium lauryl sulphate	5g
2	Stearic acid	1.4g
3	Tragacanth	0.4%
4	Sodium hydroxide	0.2g
5	Sulphur powder	0.4g
6	Water	20ml
7	Perfume	5ml
8	Preservative	1g

PROCEDURE

- [1] Dissolve sodium hydroxide and tragacanth (0%, 0.2%, 0.4%) in a small quantity of water with heating at 75⁰C, mix thoroughly using magnetic stirrer.
- After the complete solubilization of sodium hydroxide and tragacanth add sulphur to this mixture and continue agitation.
- Take sodium lauryl sulphate and stearic acid, then add to the aqueous solution and mix well

using magnetic stirrer, maintain the temperature at 60⁰C.

- Cool the reaction mixture and then add perfume and preservatives.

VII. EVALUATION OF SHAMPOO

Shampoos are evaluated for,

1. **Physical appearance:** Formulation prepared was evaluated for the clarity, colour, odour, and foam producing ability.

2. Foaming ability:[7] Foaming is essential for consumer acceptance although it is not a measure of cleaning action. Cylinder shake method was used for determining foaming ability. Shampoo solution was put into a 250ml graduated cylinder and covered the cylinder with hand and shaken for 10 minutes. The total volume of foam contents after 1 minute shaking were recorded.

3. Cleaning properties:[8] Also known a detergency action, since shampoos are used for the cleaning properties. So, it is the real measurement of property of shampoo. It is done on wool-yam and grease. Place 5.0g of wool- yam covered in grease and put it in 200ml of water at 35°C containing 1.0g of shampoo in a flask. Shake the flask for 4 minutes at 50rpm. Remove the sample from solution, dry it and weigh. Now calculate the amount of grease and dirt, remove under experimental conditions.

4. Stability study

a) Foam and foam stability: The Ross-Miles foam column test. In this test. 200ml of a surfactant solution is dropped into a glass column containing 50ml of the same solution. The height of the foam generated is measured immediately and again after a specified time interval, and is considered proportional to the volume.

b) Rinsing: Technique is to employ skilled beauticians to make comparisons of the performance of several shampoos. Here rinsing can be more easily related on a comparative basis.

c) Consistency: The consistency of formulated shampoo was determined by hand. Take pinch of shampoo and rubbed it with finger.

5. Determination of pH: The pH of 5% v/v shampoo solution in distilled water was measured using pH meter at room temperature or at 45°C temperature.

6. Dye solubility test: This test is based on the principle that the dye can be dispersed uniformly throughout the phase in which it is more soluble. Amaranth and methylene blue, water soluble dyes readily tint the water phase of o/w emulsion, while Sudan III and scarlet red, oil soluble dyes readily colour the oil phase of the w/o emulsion. The selected dye is mixed with the sample solution, mix well and then observed under microscope.

7. Dilution test: This test is based on the fact that when a dispersion medium is added to an emulsion, no phase separation is possible. Water is added to o/w emulsion, it is freely miscible with the emulsion and no phase separation occurs. Similarly, addition of oil to w/o emulsion shows miscibility.

VIII. RESULT AND DISCUSSION

The aim of the present work is to prepare anti-dandruff shampoo using two anti-dandruff agents such as stearic acid, and sulphur. To this formulation add tragacanth in various concentration such as 0%, 0.2%, 0.4%. The prepared anti-dandruff shampoo was evaluated for physical appearance/visual inspection, determination if pH, determine % of solid contents, surface tension measurement, foam ability.

1. Physical appearance/ visual inspection
The formulations prepared were appeared pale white colour.



2. Foaming ability: All the three shampoos showed similar foaming characteristics in distilled water. All three shampoos showed comparable foaming properties. F2 shows better foaming property compare with others.



3. Cleaning property: cleaning action was tested on wool yarn in grease, although cleaning or soil/sebum removal is the primary aim of shampoo. As seen from the results, there is a significant difference in the amount of dirt removed by different shampoos. The results of detergency studies showed that the F2 formulation has significantly similar detergency ability, when compared with others.

4. Stability studies

1. Foam and foam stability

All the three-shampoo showed similar foaming characteristic in distilled water. The F2 formulation produced stable foams there was little bit change in foam volume.

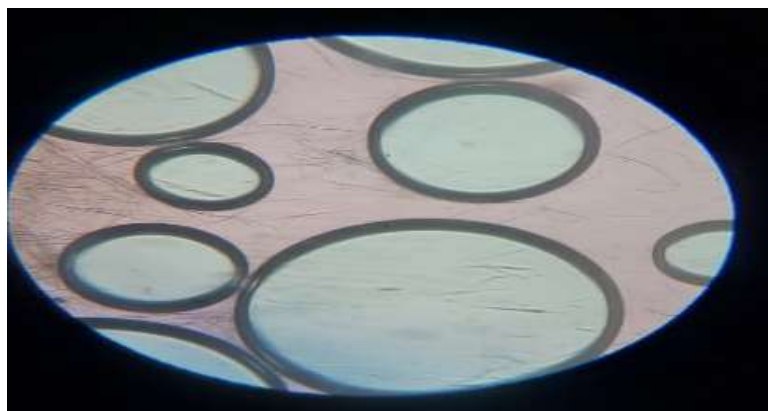
2. Consistency

The F2 formulation shows smooth consistency compare with other formulation.

5. Determination of P^H : All the shampoos were acid balanced and were ranged 5.5- 5.9 which is near to the skin pH.



6. Dye solubility test: The water-soluble dye amaranth is miscible with shampoo indicating the o/w emulsion. Whereas oil soluble dye shows immiscibility. Thus, both the tests confirm the o/w type emulsion.



7. Dilution test

Water is added to this sample solution, it is freely miscible with the emulsion and no phase separation occurs. Which indicate it is a o/w emulsion.

EVALUATION PARAMETER	OBSERVATION
Appearance	Pale white colour
Ph	5.5-5.9
Consistency	Smooth
Foam stability test	Stable foam
Dye solubility test	O/W type emulsion

IX. CONCLUSION

Many people suffer from hair disorders such as dandruff, alopecia, and dermatitis. Shampooing is the best treatment for this type of disorders. The main purpose behind this investigation was to develop a stable and functionally effective shampoo by minimising side effect and provide better antidandruff action and improve consumers compliance. The formulated shampoos were not only safer than the chemical conditioning agents. The pH of the shampoos was adjusted to 5.5, to retain the acidic nature of scalp. However, the aesthetic attributes, such as lather and clarity, of the laboratory shampoo are not comparable with the marketed shampoos. Today the false notion among consumers that a shampoo that foams well, works well, and no real effort on the part of manufacturers to counter this fallacy. The F2 formulation shows better foaming property, good appearance and smooth consistency.

The main purpose behind this study to develop a stable and functionally effective antidandruff shampoo, the side effects due to the use of synthetic ingredients is one of the challenges. So, in this formulation we are aiming to reduce the side effect and provide the better action

also add the tragacanth to this formulation for providing thickening action. Tragacanth has better thickening action so it will provide formulation to become consistently produced and maintain the texture of the formulation. The F2 formulation is consider as a better formulation as per the appearance, consistency and foaming ability. The F1 formulation which appear as loose and less viscous. The F3 formulation which appear as high viscous, they do not possess normal shampoo consistency so it not applicable to daily life. The F2 formulation shows smooth consistency and viscous nature so it is chosen as a good formulation compare to others.

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