



## Research

# Formulating a Natural, Effective Anti-Dandruff Shampoo with Rice Starch and Flaxseed

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Article History	Abstract:
Received: 15/03/2024 Revised : 12/04/2024 Accepted : 25/04/2024 DOI: 10.62896/ijpdd.1.5.8	<p><i>The constant evolution of scientific research has led to the development of innovative solutions for common problems. One such issue that has plagued the majority of the population is Dandruff. Dandruff is a common scalp disorder characterized by flaking, itching and irritation. While conventional anti-dandruff shampoos contain synthetic ingredients that can be harsh on the scalp, there is growing interest in developing natural, plant-based alternatives. Rice starch and flaxseed are two promising ingredients for formulating a mild, effective herbal anti-dandruff shampoo. This article will delve into the formulation and evaluation of an anti-hair fall shampoo that utilizes the nourishing properties of rice starch and flaxseed.</i></p> <p><b>Keywords:</b> Rice starch, Flaxseed, Dandruff, Scalp, Flaking, Itching.</p>

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## 1. Introduction

Dandruff is a common scalp condition characterized by flaking, itching and irritation. The primary culprit behind dandruff is a yeast known as *Pityrosporum*, which disturbs the scalp's health <sup>[1,15]</sup>. While there are many commercial anti-dandruff shampoos available, they often contain harsh synthetic ingredients that can further irritate the scalp. As a result, there is growing interest in developing natural, plant-based anti-dandruff shampoo formulations that are effective yet gentle on the scalp <sup>[11]</sup>. Rice starch and flaxseed are two promising natural ingredients that have been studied for their potential use in anti-dandruff and other personal care products. Rice starch acts as a natural absorbent and thickening agent <sup>[12]</sup>, while flaxseed contains beneficial compounds like lignans that can soothe and nourish the scalp <sup>[13]</sup>. These natural ingredients promise an effective and safer alternative to conventional anti-dandruff shampoos, which often carry adverse side effects like hair loss and irritation <sup>[15]</sup>. In order to formulate this innovative shampoo. We delve into the mixture of rice starch and flax seeds, both renowned for their hair benefits. The aim is to produce an anti-dandruff formulation, that not only tackles dandruff but does so with minimal risk to the user's scalp health or overall well-being. <sup>[16]</sup> This article will guide you through the process of formulating such a shampoo, from understanding the benefits of each ingredient to the evaluation of the final product.

## Understanding Dandruff

Dandruff, a common scalp condition, manifests as flaky skin on the scalp and can be attributed to several factors, each influencing the scalp's health in different ways. Understanding these causes is crucial for effective treatment:

- **Irritated and Oily Skin:** Known medically as seborrheic dermatitis, this condition affects oily areas of the body, including the scalp, causing red, greasy skin covered with flaky white or yellow scales. <sup>[17]</sup>
- **Yeast-like Fungus (Malassezia):** This fungus lives on the scalps of most adults but can sometimes irritate the scalp and cause more skin cells to grow. When these extra skin cells die and fall off, they mix with the oil from the hair and scalp, forming dandruff. <sup>[17]</sup>

- **Sensitivity to Hair Care Products (Contact Dermatitis):** Some people react to certain hair care products with a red, itchy, scaling scalp. Shampooing too often or using too many styling products can also irritate your scalp, leading to dandruff.<sup>[17]</sup>

Prevention and management of dandruff involve a multifaceted approach, addressing the underlying causes and symptoms:

1. **Good Hygiene Practices:** Regular washing of the hair removes flakes, reduces oiliness, and prevents dead skin cell buildup. Finding the right balance is key, as washing too much or too little can exacerbate dandruff.<sup>[18]</sup>
2. **Choosing the Right Products:** For mild dandruff, a gentle daily shampoo may help. In more severe cases, medicated shampoos containing active ingredients like ketoconazole, selenium sulfide, coal tar, zinc pyrithione, or salicylic acid are recommended.<sup>[18]</sup>
3. **Lifestyle Adjustments:** Stress management, a healthy diet, developing a hair and scalp care routine, and limiting hair-styling products can all contribute to reducing dandruff.<sup>[19]</sup>

Risk factors for dandruff include age, being male, and certain illnesses like Parkinson's disease, HIV, or a compromised immune system, which can increase susceptibility or severity of dandruff.<sup>[17]</sup> Recognizing these factors is essential in tailoring a prevention or treatment strategy that is both effective and sustainable.

### Benefits of Rice Starch for Hair

Rice starch is extracted from rice grains and has several useful properties as a cosmetic ingredient, rice bran oil, a byproduct of rice milling, contains compounds like tocotrienols and gamma-oryzanol that have antioxidant and anti-aging properties. Rice bran oil is sometimes used in sunscreens, anti-aging products and skin lightening formulas<sup>[6]</sup>.

Rice starch, particularly in the form of rice water, has been a traditional hair care remedy in several Asian countries for thousands of years, cherished for its numerous benefits for hair health. Here's a breakdown of how rice starch can be beneficial for hair, along with some practical tips on using it:

- **Detangling and Smoothing:** Rice water can significantly detangle hair, making it smoother and easier to manage. This effect can reduce the amount of breakage during combing and styling, promoting overall hair health.<sup>[4]</sup><sup>[20]</sup>
- **Enhancing Shine and Strength:** Regular use of rice water has been reported to increase hair shine and strength. The starch in rice water coats the hair strands, providing a protective layer that enhances its natural sheen and resilience against damage.<sup>[5]</sup><sup>[20]</sup>
- **Anti-aging Activity:** Rice water, the starchy liquid left over after soaking or cooking rice, also shows promise as an anti-aging ingredient that can be incorporated into topical gels and other cosmetic products.<sup>[7]</sup>

### Considerations for Different Hair Types:

- While rice water offers numerous benefits, it's important to note that it contains starch, which can be drying for some hair types, especially curly hair. It's recommended to start with a patch test and use it sparingly to see how your hair responds.<sup>[21]</sup>
- Individuals with hair conditions like eczema or alopecia should proceed with caution, testing rice water on a small scalp area before applying it more broadly. This precaution helps to avoid any adverse reactions.<sup>[22]</sup>

In summary, rice starch in the form of rice water presents a natural, affordable, and effective way to enhance hair health, making it smoother, stronger, and more lustrous. However, its benefits and suitability can vary based on individual hair types and conditions, emphasizing the need for personalized experimentation and use.<sup>[20]</sup>

### Benefits of Flax Seeds for Hair

Flaxseed, also known as linseed, is a nutrient-dense oilseed that is rich in omega-3 fatty acids, lignans and dietary fibre. Flaxseed oil and extracts are used in skin and hair care products for their emollient, nourishing and protective properties<sup>[3]</sup>.

The lignan compounds in flaxseed, particularly secoisolariciresinol diglucoside (SDG), have potent antioxidant and anti-inflammatory activities. Flaxseed lignans have been studied as novel wound healing agents and may help repair and regenerate the skin barrier<sup>[8]</sup>.

Flaxseed mucilage, the soluble fibre component, also has potential as a natural emulsifier and thickener in cosmetic formulations<sup>[9]</sup>.

For hair care, flaxseed extracts can be incorporated into hair gels and styling products to provide moisturizing, smoothing and taming effects [10]. The combination of flaxseed oil and mucilage can produce stable emulsions and microemulsion gels suitable for skin and hair applications [9], [11].

Their rich nutritional profile includes:

- **Omega-3 Fatty Acids:** Vital for nourishing hair follicles and promoting hair growth. These fatty acids are known for their anti-inflammatory properties, which can aid in reducing scalp inflammation, a common cause of hair loss. [23] [24]
- **Vitamins B and E:** B vitamins strengthen hair, while Vitamin E acts as an antioxidant, protecting the scalp and hair from oxidative stress. This duo is essential for maintaining strong, healthy hair and promoting faster hair growth. [23]
- **Proteins and Antioxidants:** Proteins are the building blocks of hair, and antioxidants help in combating the damage caused by free radicals, thus promoting hair health and growth. [24]

The benefits of flax seeds extend beyond nutrition, providing practical applications for hair care:

1. **Hair Growth and Strength:** Regular use of flax seeds can lead to longer, lustrous locks, thanks to their ability to promote hair growth and strengthen hair strands. This results in reduced hair fall and increased hair volume. [23] [24]
2. **Improved Hair Texture and Elasticity:** Flax seeds enhance hair elasticity, leading to less breakage. They also improve the hair's texture, making it smoother and more manageable. This is particularly beneficial for detangling hair and adding shine [23]
3. **Scalp Health:** Flax seeds can alleviate scalp conditions and balance scalp pH levels. Their nutritional composition helps in nourishing the hair follicles and regulating oil production, contributing to a healthier scalp and hair [23]

Flaxseed oil and gel are two popular forms for hair application, each offering unique benefits:

- **Flaxseed Oil:** Used in various hair health practices, flaxseed oil helps seal the hair cuticle, preventing breakage and frizz. Its rich content of omega-3 fatty acids, B vitamins, and Vitamin E makes it a potent remedy for promoting hair growth and reducing hair fall [23]
- **Flaxseed Gel:** A natural hair styling gel that provides excellent moisture retention, promotes curl definition, and combats frizz. It's especially beneficial for curly, straight, dry, damaged, wavy, and 4c hair types. Flaxseed gel can be used as a hair mask, scalp treatment, and hair rinse, offering versatility in hair care routines [23]
- In conclusion, incorporating flax seeds into one's diet or using flaxseed oil and gel for hair care can significantly impact hair growth, strength, and overall health. Their rich nutritional content and practical applications make flax seeds a valuable addition to any hair care regimen

### 1. Material and Method

The Glassware used were as following-:

S.no	Glassware
1)	Beaker
2)	Glass rod
3)	Measuring cylinder
4)	Volumetric flask
5)	Graduated Cylinder
6)	Erlenmeyer Flask

3. The Instrument used were as following-:

S.no	Instrument
1)	Extraction Unit (Heating mantle, RBF, Condenser, Erlenmeyer Flask)
2)	Hot Plate
3)	pH Meter or pH Paper
4)	Mortar and Pestle

5)	Weighing balance
6)	Water bath

## 2. Formulation of Rice Starch and Flaxseed Anti-Dandruff Shampoo

Based on the beneficial properties of rice starch and flaxseed, an effective herbal anti-dandruff shampoo can be formulated using these key ingredients: Rice starch: 1-5% w/w to provide gentle exfoliation, oil absorption and thickening [5] Flaxseed oil: 1-3% for nourishment and anti-inflammatory effects [3] Flaxseed mucilage: 0.5-2% as a co-emulsifier and hair conditioning agent [10], [9] Mild surfactants: 10-15% Humectants: 1-3% glycerine or propanediol for hydration Preservatives: 0.5-1% natural preservative system Essential oils: 0.5-1% tea tree, peppermint or lavender oil for fragrance and anti-microbial effects Purified water to 100%.

The shampoo is prepared by first dispersing the rice starch in the water phase, then combining with the flaxseed mucilage, Then SLS, distilled water, glycerine, coconut oil, propyl paraben, rose water were added.

The flaxseed oil is then slowly incorporated to form an emulsion. Finally, the essential oils and preservatives are added once the mixture has cooled [1].

S.no	INGREDIENTS (MG)	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
1.	Distilled water (ml)	50	50	50	50	50	50	50	50	50	50
2.	SLS (gm)	5	5	5	5	5	5	5	5	5	5
3.	Rice starch (gm)	0.50	2	2	3	4	5	5	-	5.50	6.50
4.	Flax seed extract (gm)	0.50	2	2.50	-	4	5	5	6	6.75	7
5.	Glycerin (gm)	0.50	1	-	2	-	3	5	5	5	5
6.	Gum Tragacanth (gm)	0.50	2	3	4	4	5	5	5	5	5
7.	Coconut oil (ml)	2	2	2	2	2	2	2	2	2	2
8.	Propyl paraben (gm)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
9.	Rose (drops)	1	2	2	2	2	2	2	2	2	2

Table 1: Composition cream of Natural, Effective Anti-Dandruff Shampoo with Rice Starch and Flaxseed cream (50gm)

### Formulation Conclusion

Formulation 7 was selected as the final formulation after considering various factors. The ingredients for this formulation included 50 ml of distilled water, 5 gm of SLS, 5 gm of rice starch, 5 gm of flax seed extract, 5 gm of glycerine, 5 gm of Gum Tragacanth, 2 ml of coconut oil, 0.05 gm of Propyl paraben, and 2 drops of rose essence.

During the formulation selection process, several combinations were evaluated. Different quantities of each ingredient were tested across multiple formulations (F1 to F10) to assess their impact on the product's performance and characteristics. Each formulation was carefully scrutinized based on criteria such as consistency, texture, cleansing efficacy, and overall user experience.

After thorough evaluation and comparison, Formulation 7 emerged as the preferred choice. It exhibited optimal attributes, including a balanced blend of cleansing agents, texturizing components, and moisturizing elements. The formulation provided satisfactory results in terms of foam production, viscosity, and skin feel.

The decision to finalize Formulation 7 was based on its ability to meet the desired product specifications effectively. The composition of this formulation was deemed suitable for achieving the intended product goals and delivering a high-quality cosmetic product to consumers.

## 3. Evaluation

Formulated shampoo was evaluated on the basis of its physical parameters like colour, odour, consistency and state of the prepared formulation.

**Colour Test:**



Fig 1: Colour- Off-white

**pH Test:**

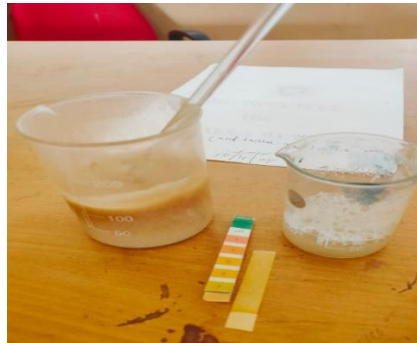


Fig 2: pH shows in picture is 7

**Foaming Test**

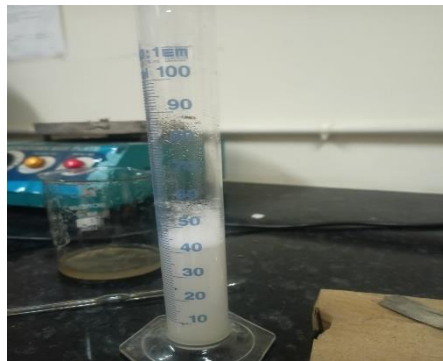


Fig 3: Foaming test shows Small and medium sized bubbles formed after 10-15 mins

**4. Conclusion**

Herbal anti-dandruff shampoos formulated with natural active ingredients like rice starch and flaxseed provide a gentler, more sustainable alternative to conventional dandruff treatments. By harnessing the unique properties of rice starch as a thickener and exfoliant, combined with the nourishing and anti-inflammatory benefits of flaxseed, formulators can create innovative and effective natural hair care products. However, further research is needed to optimize the ideal combination and concentration of these botanical ingredients, as well as to validate their clinical performance in well-designed trials [13]. As consumer demand for clean, plant-based cosmetics continues to grow, ingredients like rice starch and flaxseed will play an increasingly important role in the development of high-performing natural personal care products.

Evaluation Test	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Color	Abbey-white	Ivory-white	Pearl-white	Bone-white	Peach-white	Dutch-white	Off-white	Off-white	Off-white	Off-white
Odor	Rose-like	Rose-like	Rose-like	Rose-like	Rose-like	Rose-like	Rose-like	Rose-like	Rose-like	Rose-like

Consistency	Thin	Thin	Thin	Thin	Thick	Thick	Thick	Thick	Thick	Thick
pH	5	5.62	6	6.25	6.42	6.95	7	6.6	7.16	7
Foaming	Foaming test shows Small and medium sized bubbles formed after 1-2 mins	Foaming test shows Small and medium sized bubbles formed after 3-4 mins	Foaming test shows Small and medium sized bubbles formed after 5-6 mins	Foaming test shows Small and medium sized bubbles formed after 7-9 mins	Foaming test shows Small and medium sized bubbles formed after 8-9 mins	Foaming test shows Small and medium sized bubbles formed after 1-10 mins	Foaming test shows Small and medium sized bubbles formed after 10-15 mins	Foaming test shows Small and medium sized bubbles formed after 2-6 mins	Foaming test shows Small and medium sized bubbles formed after 5-10 mins	Foaming test shows Small and medium sized bubbles formed after 2-10 mins

Table 2: Evaluation of Natural, Effective Anti-Dandruff Shampoo with Rice Starch and Flaxseed cream (50gm)

### 5. Scope for Future Research

This study opens avenues for future research and development in the realm of natural medicine. The potential incorporation of *Rice starch and Flaxseed* into the armamentarium of anti-dandruff interventions offers a nature-derived alternative for individuals seeking holistic approaches to gastrointestinal health.

### 6. Final Thoughts

As we navigate the landscape of natural remedies for Dandruff, *Rice starch and Flaxseed* emerges as a promising candidate. This study marks a significant step toward the potential use of for the treatment of Dandruff, offering a substantial contribution to the evolving landscape of phyto-therapeutics.

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