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"HERBAL HAIR CONDITIONER DEVELOPMENT:

A study on the Synergistic Effects of Multiple Plant Extract"

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Abstract: Hair plays a vital role in protecting the scalp and is an essential aspect of human appearance. Hair conditioner is a hair care formulation applied after shampooing, targeting the hair strands and tips to enhance their condition, and is then rinsed off. It helps improve hair manageability and imparts a shiny, healthy appearance. The primary goal of using a conditioner is to minimize friction between hair strands, making combing and styling easier.

This study focused on developing an effective hair care formulation that aligns with consumer preferences and evaluating its performance. Three types of conditioners were created: Herbal Hair Conditioner, Synthetic Hair Conditioner, and Ayurvedic Hair Conditioner. The Herbal Conditioner featured rosemary as the key ingredient, while the Ayurvedic formulation included flaxseed, rice, and fenugreek seeds. These conditioner formulations were assessed based on their sensory (organoleptic) characteristics and various physicochemical properties, including pH, Dirt Dispersion Test, Cleaning Ability, and Stability.

KEYWORDS: Herbal Hair Conditioner, Synthetic Hair Conditioner, Ayurvedic Hair Conditioner, Organoleptic Evaluation, Physicochemical Analysis, Stability Assessment.

I. Introduction

In recent years, the use of herbal products has significantly increased, with around 20-30% of the population now incorporating them into their routines. These products are derived from natural sources such as plant leaves, flowers, stems, seeds, bark, and medicinal herbs. Among these, hair conditioners are essential hair care items used after shampooing to nourish and restore the hair. They help bring back the hair's natural texture, making it softer, shinier, and more manageable. Suitable for all hair types, conditioners replenish moisture and smoothen the cuticle layer of hair strands. Those enriched with antioxidants can also minimize damage from ultraviolet (UV) rays, including fading of hair color and deterioration of hair proteins.

Plant-based conditioners may still contain certain chemicals and sulfates, though modern formulations extend far beyond simple hair cleansing. Today's conditioners offer additional benefits such as enhanced shine and conditioning effects, and they are generally formulated to be gentle on the skin and eyes.

Creating an effective herbal conditioner involves selecting specific natural ingredients, each contributing unique functions to the final product. Hair care items, including lotions and conditioners, are widely

appreciated in the cosmetic industry and often feature herbal extracts like fenugreek, known for its ability to reduce hair loss and improve hair condition. As a result, this study aims to develop a conditioner using herbal components and assess its physical and chemical characteristics, including pH, viscosity, solid content, foam production, dispersibility, wetting ability, surface tension, and stability.

Herbal conditioners are designed to tackle common hair problems without relying on synthetic ingredients. By evaluating these formulations against commercial alternatives, this research highlights the potential benefits of natural products. Since herbal formulas consist of complex organic compounds from various plant parts, they can offer safer and healthier solutions for hair care. This encourages consumers to make informed choices that promote both personal health and environmental sustainability.

HOW TO USE CONDITIONER:

Fig no:1 how to use conditioner

Hair Anatomy:

Hair functions as a unified system with distinct physical and chemical properties. It has a complex structure made up of various parts that work together harmoniously. Every strand of hair consists of two main components: the shaft and the root. The shaft is the part of the hair that is visible above the skin's surface, while the root lies beneath the skin, extending into the deeper layers. The root is housed within a hair follicle, a protective sheath of skin and connective tissue. These follicles are closely linked to sebaceous (oil) glands, which help lubricate the hair. Attached to each follicle is a tiny arrector pili muscle, which contracts to make the hair stand up, a response often triggered by cold or emotion.

Hair follicles are rich in nerve endings that detect even the slightest movement, making them highly sensitive to environmental changes like a gentle breeze. At the base of the root is an enlarged structure called the hair bulb, which surrounds the dermal papilla-a vital structure that supplies blood and nutrients to support hair growth. Near this area, new hair cells continuously develop and push upward to form the growing hair shaft.

Hair is made up of two main parts:

1. **Hair Shaft** – The visible part of the hair that extends above the skin's surface. It is composed of three layers:

- **Cuticle**: The outermost layer made of flat, overlapping cells that protect inner layers.
- **Cortex**: The thickest layer containing melanin (hair pigment) and keratin (strength and structure).
- **Medulla**: The innermost layer, often absent in fine or light hair, consisting of soft, spongy cells.

2. **Hair Follicle** – The part of the hair located beneath the skin. It includes:

- **Hair bulb**: The base of the follicle where hair growth begins.
- **Dermal papilla**: Provides blood supply and nutrients for hair growth.
- **Sebaceous (oil) gland**: Produces sebum to lubricate hair and scalp.
- **Arrector pilli muscle**: A small muscle that causes hair to stand up.

Hair is primarily made up of a protein called keratin. Its growth is influenced by genetics, hormones, nutrition, and overall health.

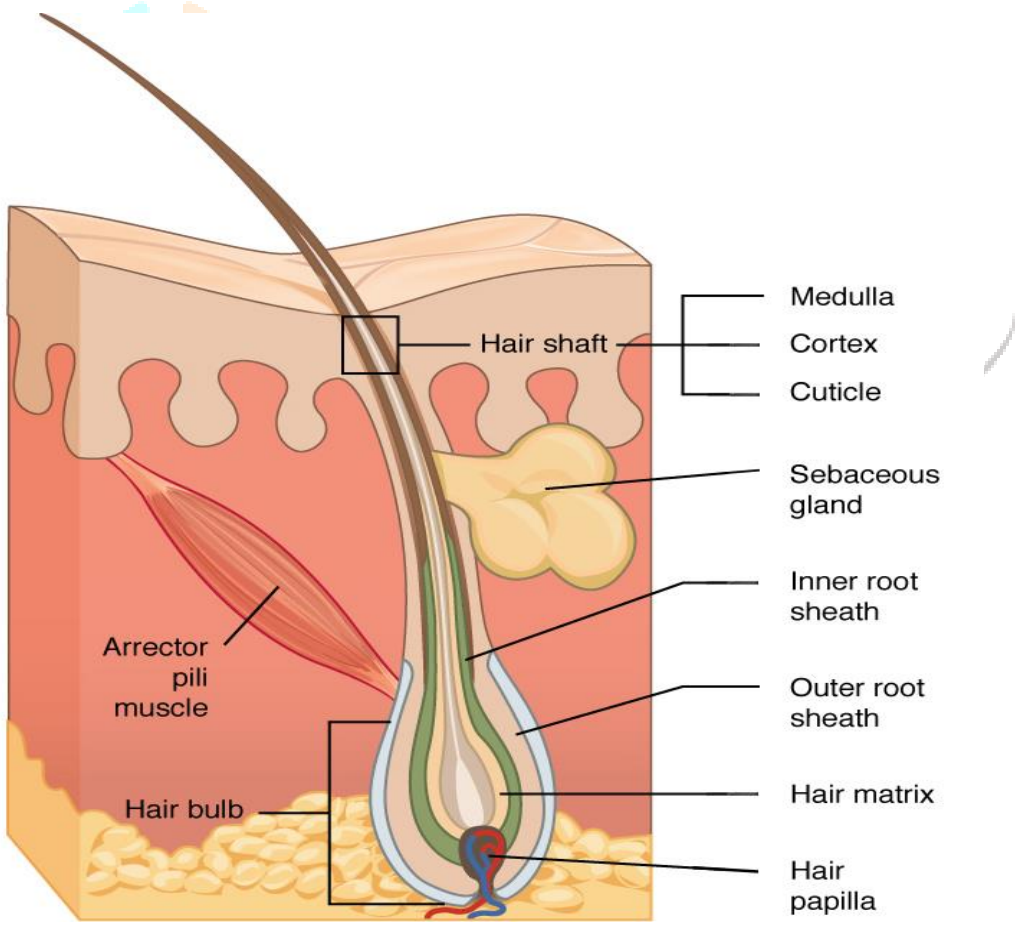

Fig no: 2 hair anatomy

Aim and Objective:

Aim: To prepare and evaluate herbal hair conditioner development: A study on the Synergistic Effects of Multiple Plant Extract.

Objective:

1. To restore moisture and nutrients to hair after shampooing.
2. To smooth and seal the hair cuticle for improved texture.
3. To enhance hair softness, shine, and manageability.

4. To reduce hair tangling and breakage.
5. To protect hair from environmental damage and heat styling.
6. To prevents styling from UV rays and heat.
7. To maintain overall hair health and appearance.

Advantages of herbal conditioner:

1. Moisturizes dry hair, preventing brittleness.
2. Detangles strands, making combing and styling easier.
3. Reduces frizz by smoothing the outer cuticle layer.
4. Enhances shine and softness, giving hair a healthy look.
5. Strengthens hair, helping to prevent breakage and split ends.
6. Protects against damage from sun, pollution, and heat tools.
7. Improves elasticity, making hair less prone to snapping.
8. Maintains scalp health, especially when made with nourishing or herbal ingredients.

Disadvantages of other conditioner available in market:

1. Causes eye irritation
2. Harmful to hair and generally toxic.
3. They dry out hair shaft and cause split ends and frizz.
4. Other conditioners mainly contain Sodium Lauryl and Ammonium Lauryl Sulfate.

II. PLANT PROFILE AND INGRIDIENTS

Fig no: 3 flaxseed

1. Flaxseed:
Biological name: Linum Usitatissimum
Family: Linaceae
Synonyms: Linseed, Alsi, Flax.

Advantages:

- Rich in omega-3 fatty acids, which can nourish hair follicles and promote hair growth.
- Contains lignans, anti-oxidants that may help protect hair from environmental damage.
- May help in reducing scalp inflammation due to its anti-inflammatory properties.
- Prevent the hair loss.
- Promote hair growth.
- Avoid split ends.
- Delays the onset of premature greying.
- Hair is strengthened from the roots.

Fig no: 4 fenugreek

2. Fenugreek:
Biological name: Trigonella foenum-graecum
Family: Fabaceae (Leguminosae)
Synonyms: Methi dana

Advantages:

- Prevent hair loss.
- Fenugreek contains lecithin, which acts as a natural emollient that conditions and moisturizes your scalp and hair deeply.
- Revives damaged hair.

- Control scalp inflammation.
- Adds shine and soft texture.
- Prevents premature grey hair.
- Contain protein, Vitamin C, iron, potassium and lecithin all of which are good for strong hair follicles.

3. Rosemary Leaves:
Biological name: Salvia rosmarinus
Family: Lamiaceae (Mint family)
Synonyms: Rosmarinus officinalis, Garden Rosemary, Compass plant

Fig no: 5 rosemary leaves

Advantages:

- Promotes the hair growth
- Prevents hair loss
- Reduces dandruff
- Delays premature greying
- Improves hair texture
- Balances scalp oil production

4. Rice flour:
Biological name: Oryza sativa
Family: Poaceae (Grass family)
Synonyms: Rice powder, ground rice, rice starch

Fig no: 6 rice flour

Advantages:

- Scalp Cleanser
- Reduced frizz
- Improved shine
- Hair growth

5. Aloevera:
Biological name: Aloe barbadensis miller
Family: Asphodelaceae

Fig no: 7 aloevera

Advantages:

- Helps to stop hair fall.
- Repair dead skin cells on the scalp.
- Improve the texture and shine of hair.
- Promotes the growth of hair.
- Prevent itching on the scalp.
- Reduce breakage of hair.

- Give moisturizing hair.

6. Vitamin E:

Biological name: Tocopherol

Advantages:

- Promoting hair growth.
- Improving scalp circulation.
- Reducing hair damage.
- Enhancing shine by nourishing hair follicles.
- Protecting against free radicals.

Fig no: 8 vitamin e

7. Methylparaben:

Biological name: Methyl 4- hydroxybenzoate

Advantages:

- Prevents growth of bacteria, mold, and yeast.
- Extend shelf life of product.
- Maintains product safety and stability.
- Effective in low concentrations.
- Compatible with most cosmetic ingredients.

Fig no: 9 methylparaben

III. METHOD OF PREPARATION

➢ Preparation of flaxseed gel:-

Added the flaxseeds to the water.

↓

Boiled this water for around 10 min.

↓

keep stirring to avoid flaxseeds from sticking to the base.

↓

Let the gel cooled down.

↓

Put the muslin cloth in a glass measuring cylinder to strain it.


Fig no: 10 flaxseed gel

➢ Preparation of fenugreek gel:-

Soak the fenugreek seeds in hot water.

↓

Allow to soak for 3-4 hours or overnight.

↓

Heat the soaked mixture gently for 5-10 minutes to enhance gel release.

↓

Grind the soaked fenugreek seeds into a smooth paste.

↓

Filter through muslin cloth to extract smooth gel, if a clearer gel is desired.


Fig no:11 fenugreek gel

➢ Preparation of rosemary leaves extract:-

Heat the water until it starts simmering.

↓

Add dry rosemary leaves and let it steep for 15-20 minutes.

↓

Once cooled strain the liquid

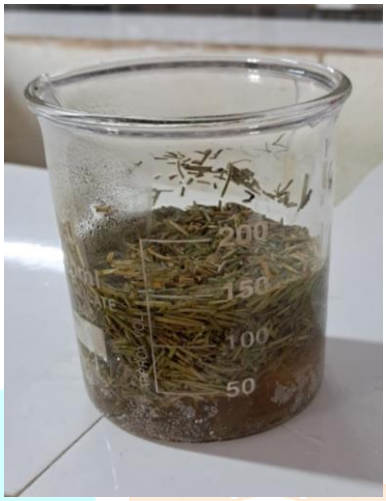

Fig no: 12 rosemary extract

FORMULATION OF CONDITIONER:-

Take the clean and dry mortar pestle.

↓

Add flaxseed gel, fenugreek gel, rosemary extract, aloevera gel and vitamin E oil

↓

Mix well all the ingredients.

↓

Afterwords slowly add rice flour while stirring continuously to avoid lumps.
Add methylparaben to increase shelf life.

↓

Pour the solution in a container.

Fig no: 13 flaxseed gel

Fig no: 14 fenugreek gel

Fig no: 15 mixing ingredients

Fig no: 16 rosemary extract

Fig no: 17 hair conditioner

IV. Formula for Herbal Hair Conditioner

Table No:- 1

No	Ingredient	F1	F2	F3	F4	F5
1	Flaxseed gel	12 ml	15 ml	10 ml	**10 ml**	12 ml
2	Fenugreek gel	10 ml	12 ml	8 ml	**11 ml**	9 ml
3	Rosemary extract	3 ml	2 ml	4 ml	**5 ml**	3 ml
4	Aloevera	12 ml	15 ml	10 ml	**11 ml**	13 ml
5	Vitamin E	0.5 ml	0.8 ml	0.3 ml	**0.5 ml**	0.6 ml
6	Rice flour	2 gm	1 gm	2.5 gm	**2 gm**	1.5 gm
7	Methylparaben	0.2 gm	0.2gm	0.2gm	**0.2gm**	0.2 gm
8	Lavender oil	0.5 ml	0.4 ml	0.6 ml	**0.7 ml**	0.5 ml

V. EVALUATION PARAMETERS

1. Physical Apperance:

The Physical Apperance includes:

Color: Pale Yellow

Odor: Pleasant

Texture: Smooth and Creamy

Fig no: 18 physical apperance

2. pH Test:

Using a digital pH meter calibrated at constant temperature, the pH of 1% of the hydrotranspiration is calculated.

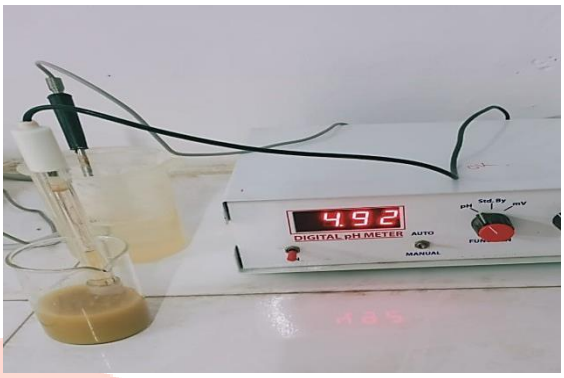

Fig no: 19 pH meter

3. Washability:

Formulation was applied to the hair and then the ease and extend of washing with water is checked manually.

4. Irritancy Test:

1-2ml of formulation was applied on dorsal side surface of left hand and observed for 2 hrs, for any signs of redness, irritancy and inflammation.

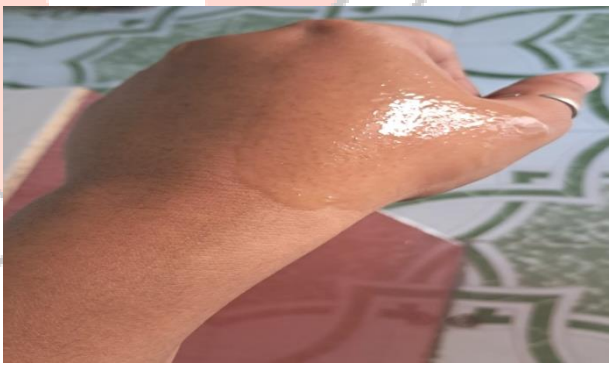

Fig no: 20 irritancy test

5. Stability Testing:

Store the herbal hair conditioner at 37 °C for 6 weeks and observe changes in color and viscosity.

6. Viscosity:

Viscosity of conditioner was done by using Brookfield viscometer at temperature of 25 °C using spindle No. 4 at 20 RPM.

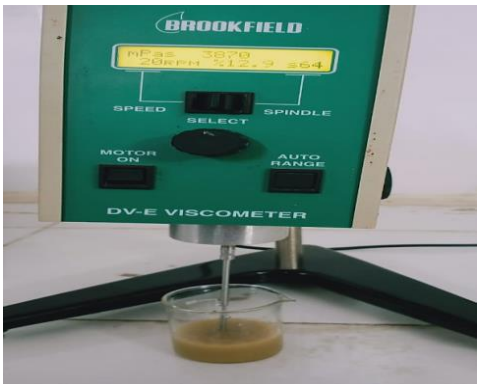

Fig no: 21 viscosity

7. Conditioning Effect:
Sufficient quantity of formulation were applied on the hair after shampooing then washed with water and observed the difference after drying of hair.

Fig no: 22 conditioning effect

8. Spreadability:
A small sample is placed on a glass plate and pressed with another plate under uniform pressure. The spreaddiameter is then measured to how easily the conditioner spread.

Fig no: 23 spreadability

VI. RESULT

Sr No.	Evaluation Parameter	F1	F2	F3	**F4**	F5
1	Color	Light Brown	Pale Yellow	Light Brown	**Pale Yellow**	Light Yellow
2	Odour	Mild	Pleasant	Pleasant	**Pleasant**	Mild
3	Texture	Watery	Watery	Smooth gel	**Smooth, Creamy**	Thick, Smooth
4	pH	5.9	4.8	5.5	**4.9**	5.7
5	Skin irritation	No irritation	No irritation	No irritation	No irritation	No irritation
6	Viscosity	2000Pa.s	2500Pa.s	4680Pa.s	**4000Pa.s**	5740Pa.s
7	Washability	2 sec	5 sec	8 sec	**3 sec**	7 sec
8	Spreadability	Not Pass	Not Pass	Pass	**Pass**	Pass

VII. DISCUSSION

The motivation behind this formulation stems from the growing demand for chemical-free hair care products that promote healthy and sustainable beauty routines. Each ingredients in the formulation was selected for its specific benefits to hair and scalp health. The preparation process was methodical, involving extraction of herbal gels and careful mixing to ensure a smooth and homogenous conditioner. The final product was tested for various parameters such as PH, viscosity, skin irritation, washability, stability, spreadability and microbial test. Results showed the conditioner to be safe, effective, and pleasant to use, with a pale yellow color, smooth texture, and a natural, pleasant aroma. The herbal conditioner demonstrated excellent conditioning effects, leaving the hair soft, manageable, and well-nourished. It also offered protective benefits against styling heat and UV rays without relying on harsh chemicals or silicones.

VIII. CONCLUSION

This Study shows the used of herbal plant products with proven efficacy as in the hair care preparation. From the above studies, it can be concluded that hair conditioner exhibits excellent conditioning properties. Conditioners are applied to hair after washing and are intended to smooth hair, improve shine and shine, repair damaged, mechanically damaged, and weathered hair. Herbal hair conditioner are free of chemical ingredients and are therefore safe to use on all scalp types. Hair conditioner contains flaxseed, fenugreek, rosemary, rice flour, aloevera and vitamin E that strengthen, smoothen and protect and promote shiny, healthy hair. pH value of hair rinse, washability, viscosity, stability and spreadability have been tested and has been found to be safe and effective to use.

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