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Keshamruta - Herbal Hair Heat Protectant Spray

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Abstract: *The present research work tries to solve the problem that associated with the excessive use of heat styling tools contributes to hair damage by causing protein degradation, cuticle disruption, and moisture loss. In response to the rising demand for natural and safe hair care alternatives, this study focuses on the formulation and evaluation of an herbal hair heat protectant spray using plant-based ingredients with thermal shielding, antioxidant, and conditioning properties. The spray was developed using herbal components such as Aloe vera, hibiscus extract, onion oil, and shea butter, selected for their proven abilities to nourish the scalp, strengthen hair strands, and provide protection against thermal stress. The hair spray formulation was evaluated a physicochemical parameter including pH, viscosity, thermal stability, and spray ability. Efficacy was assessed by applying the spray to hair strands prior to heat exposure, followed by microscopic analysis to observe structural integrity having a light purple in color with pleasant odor. The findings demonstrated that the herbal spray significantly minimized heat-induced damage while preserving hair texture and hydration. This study highlights the effectiveness of herbal ingredients in creating a safe and sustainable alternative to conventional heat protectant products*

Keywords: Hair Health, Herbal, Heat Protectant, Aloe vera

I. INTRODUCTION

Hair sprays are indeed popular for styling and ensuring that hair stays in place throughout the day. They work by coating the hair with a fine mist of polymer-based ingredients that help to lock the style in position. This is particularly useful for maintaining volume, curls, or even sleek, straight styles.[1]

Traditional hair sprays are usually made with a mix of chemicals, including alcohols, silicones, and synthetic polymers, which help provide hold and texture. While they effectively lock in styles and maintain hair's shape, some people are concerned about the long-term effects of these synthetic ingredients on both hair health and the environment.

As a result, many consumers are shifting towards more natural and eco-friendly alternatives. Natural hair sprays typically use plant-based ingredients, such as aloe vera, sugar, or essential oils, to provide hold and nourishment without the harsh chemicals. Some of these natural ingredients can even offer benefits like hydration, shine, or scalp care. [2-4]

HAIR:

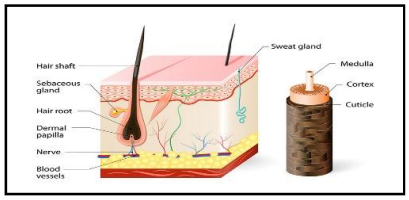

Fig.1- Hair Root Structure

- **Heat Damaged Hairs:** Heat-damaged hair occurs when excessive use of styling tools like flat irons, curling wands, and blow dryers' strips hair of its natural moisture, leading to dryness, brittleness, and breakage. Fortunately, with consistent care and the right products, you can restore your hair's health and vitality.[5]

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Fig.2- Heat Damaged Hairs

Applications:

- ✓ **Protection from Heat Damage:** Herbal heat protectants form a barrier around the hair strands that helps to minimize heat damage by reducing moisture loss and preventing the cuticle from becoming dry and brittle when exposed to high temperatures.[6]
- ✓ **Adds Shine and Smoothness:** Many herbal heat protectant sprays contain natural oils or plant extracts [like argan oil, coconut oil, or aloe vera] that help to smooth the hair, reducing frizz and adding a healthy, shiny appearance.[7]
- ✓ **Hydration and Moisture Lock:** Ingredients like glycerin, aloe vera, and various oils hydrate the hair, helping to lock in moisture. This prevents the hair from becoming dry and prone to breakage after styling.
- ✓ **Enhances Hair Health**: Herbal ingredients such as chamomile, rosemary, and lavender can have nourishing and strengthening properties. These can improve the overall health of your hair over time by providing antioxidants and other beneficial nutrients. [8]

ADVANTAGES:

- ➢ **Natural Protection Without Harsh Chemicals:** Herbal heat protectants often exclude sulfates, parabens, silicones, and alcohols, making them suitable for sensitive scalps and those seeking clean beauty products. For instance, some sprays are formulated with ingredients like flaxseed, aloe vera, and shea butter, which naturally shield hair from heat damage.
- ➢ **Enhanced Hair Health:** Many herbal sprays are enriched with vitamins and antioxidants that not only protect but also nourish the hair. Ingredients such as green tea, aloe vera, and apple cider vinegar can help maintain the hair's natural moisture balance, reducing the risk of dryness and breakage.
- ➢ **Suitable for All Hair Types:** Whether you have curly, straight, fine, or thick hair, herbal heat protectant sprays are designed to cater to various hair textures. Products like Innersense Organic Beauty's Hair Love Prep Spray are formulated to provide thermal care, strengthen hair, and restore shine, making them ideal for all hair types.
- ➢ **Lightweight and non-greasy:** Unlike some traditional heat protectants that can weigh hair down, herbal sprays often have a lightweight formula that doesn't leave a greasy residue. This ensures that your hair remains voluminous and manageable after styling.[9,10,11]

DISADVANTAGES:

- ➢ **Limited High-Temperature:** Protection Herbal heat protectants may not provide adequate protection against extremely high temperatures. Some products offer protection only up to 425°F [218°C], which might not be sufficient for those who frequently use styling tools at higher temperatures.
- ➢ **Potential Residue and Greasiness:** Certain herbal sprays can leave a greasy residue on the hair, especially if applied in excess. This can weigh down the hair, making it appear limp and oily. For instance, some users have reported that products like the Herbal Essences Bio: Renew Argan Oil & Aloe Heat Protectant Spray made their hair greasy and heavy.
- ➢ **Inconsistent Application:** The spray mechanism of some herbal protectants may not distribute the product evenly, leading to patchy coverage. This inconsistency can result in areas of the hair being more protected than others, potentially causing uneven styling results.

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- **Dryness with Overuse:** Overusing heat protectant sprays can lead to dryness. Similar to hairsprays, excessive application can trap moisture and oils in the hair, leading to a straw-like texture and increased brittleness. [12,13,14]

II. AIM AND OBJECTIVE

- **Aim of Heat Protectant spray:**
- Shield hair from heat damage caused by styling tools like straighteners and blow dryers.
- Nourish and strengthen hair with natural, herbal ingredients.
- Reduce frizz and dryness by locking in moisture.
- Enhance shine and smoothness for a healthier appearance.
- **Objective of Heat Protectant spray:**
- Form a protective barrier against heat styling tools.
- Minimize hair shaft damage during thermal styling.
- Deliver herbal nutrients to improve hair health.
- Support hair moisture retention during heat exposure.

III. MATERIALS AND METHODS

Materials used in Herbal Hair Heat Protectant Spray:

1. **Aloe vera Gel:**

Fig .3– Aloe vera gel

- **Common name**: Aloe Barbadensis Miller
- **Biological source**: *Aloe Barbadensis Asphodeloideae*
- **Active Ingredients**: Vitamins, Enzymes, Minerals, Sugars, Lignin, Saponins, Salicylic Acids and Amino Acids
- **Medicinal Uses**: Antioxidant and antibacterial properties accelerate wound healing

2. **Hibiscus Oil:**

Fig.4 – Hibiscus oil

- **Common name**: Hibiscus Rosa- Sinensis
- **Biological source**: Hibiscus rosa- sinensis *Malvaceae*
- **Active constituents**: Anthocyanins and Polyphenols [Protocatechuic Acid and Quercetin]
- **Medicinal Uses**: Natural UV Protection, Reduces Frizz and Flyaways, Strengthens Hair Beaches, Enhances Shine & wimpiness

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3. **Honey:**

Fig .5- Honey

- **Common name:** Honey, Bee Honey
- **Biological source**: honeybees from the nectar of various flowering plants.
- **Active Ingredients**: proline, glutamic acid, aspartic acid, and arginine, Flavonoids [e.g., quercetin, kaempferol, pinocembrin] and phenolic acids.
- **Medicinal Uses**: Antimicrobial and Antioxidant Properties

4. **Shea Butter:**

Fig.6 - Shea Butter

- **Common name**: Shea butter, Karité butter
- **Biological source**: Primarily sourced from West and East Africa
- **Active Ingredients**: Oleic acid, stearic acid, linoleic acid, palmitic acid, and arachidic acid,Tocopherols, phenols.
- **Medicinal Uses**: Moisture Retention, Heat Shielding, Scalp Health, Frizz Control

5. Almond oil :

Fig .7– Almond oil

- **Common name**: Sweet Almond Oil
- **Biological source**: Cold-pressed from the seeds of the sweet almond tree, primarily cultivated in regions like California and the Mediterranean.
- **Active Ingredients**: Oleic acid [monounsaturated], linoleic acid [polyunsaturated], Vitamin E [tocopherols], Vitamin A, Vitamin D Magnesium, calcium, potassium, Amino acids contributing to hair strength, Phenolic compounds
- **Medicinal Uses**: Heat Shielding, Moisture Retention, Scalp Health, Frizz Control

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6.Coconut Oil:

Fig.8– Coconut oil

- **Common name**: Coconut oil
- **Natural source**: Cold-pressed from the dried meat[copra] of mature coconuts, generally cultivated in tropical regions.
- **Active constituents:** Lauric Acid roughly 41.8 of total composition., Myristic Acid 16.7%, Palmitic Acid 8.6%
- **Medicinal Uses:** Heat Protection, Moisture Retention, Protein Preservation, Shine and Smoothness

7. Castor Oil:

Fig .9– Castor oil

- **Common name:** Castor Oil
- **Biological source**: Ricinus communis [Castor bean factory]
- **Active constituents**: Ricin oleic Acid,Other Adipose Acids, Oleic Acid 2 – 6%, Linoleic Acid 1 – 5%, Stearic Acid 0.5 – 1%,Palmitic Acid 0.5 – 1%,α- Linolenic Acid 0.5 – 1%
- **Medicinal Uses**: humidity Retention, crown health, Strengthening Hair

8. Propolis :

Fig .10- Propolis

- **Common name**: Propolis
- **Biological source** : mixing slaver and beeswax with exudate gathered from tree kids, tire overflows, or other botanical sources
- **Active chemical constituents** : lipid, beeswax, essential canvases, pollen, and organic factors.
- **Medicinal uses**: antimicrobial andanti-inflammatory goods

9.Sunflower oil:

Fig.11 - Sunflower oil

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- **Common name**: Sunflower Oil
- **Biological source**: *Helianthus annuus* [Sunflower plant]
- **Active chemical ingredients**:Linoleic Acid [Omega-6]: Approximately 59%, Oleic Acid [Omega-9]: Approximately 30%, Palmitic Acid: Around 6%, Stearic Acid: Approximately 5%
- **Medicinal uses**: Heart Health, Antioxidant Properties, Skin Health, Anti-inflammatory Effects, Immune System Support

10. Onion oil:

Fig .12– Onion oil

- **Common name**: Onion
- **Biological source**: *Allium cepa*
- **Active chemical constituents**: Sulfur Compounds similar as diallyl disulfide, which contribute to its distinctive smell and have antioxidant parcels. Flavonoids Including quercetin, which retainanti-inflammatory and antioxidant goods
- **Medicinal uses**: Strengthens Hair, Prevents Heat Damage, Enhances Shine, Reduces Frizz

11.Carry Leaves Oil:

Fig.13 – Curry leaves oil

- **Common name**: Curry Leaves Oil
- **Biological source**: *Murraya koenigii* [Curry leaf plant]
- **Active chemical ingredients**: Beta-Carotene: A precursor to vitamin A, essential for healthy hair growth and scalp maintenance.
- **Medicinal uses**: Strengthens Hair, Prevents Premature Graying, Enhances Shine and Texture, Moisturizes and Conditions,Improves Scalp Health

12.Neem oil:

Fig .14– Neem oil

- **Common name**: neem oil
- **Biological source**: Neem oil is obtained from the seeds of the **Neem tree** [*Azadirachta indica*], which is native to India and other parts of South Asia.
- **Active chemical ingredients**:Azadirachtin: A compound known for its insecticidal properties.Nimbin, Nimbidin, and Nimbolide

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- **Medicinal uses:** Promotes Hair Growth: Regular use of neem oil can help improve blood circulation to the scalp, which can promote healthy hair growth and reduce hair thinning.

IV. PREPARATION METHOD

Step 1: Measuring Ingredients

- ✓ For 25 mL batch, use the percentage directly [e.g., 30% of 25 mL = 7.5 mL Aloe Vera].

Step 2: Preparing the Water Phase [Phase A]

- ✓ In a clean beaker, add Aloe Vera Gel and honey. Mix gently.
  - Preparation method for Aloe Vera gel:
    - Wash a fresh Aloe Vera leaf thoroughly.
    - Cut off the thorny edges and peel the green skin.
    - Scoop out the clear gel using a spoon.
    - Blend the gel for a smooth texture.
    - Add vitamin E oil or lemon juice.
    - Store in a clean, airtight container in the refrigerator.
- ✓ Dissolve propolis, acacia gum, vit E into the mixture. Stir until fully dissolved.
- ✓ Set aside

Step 3: Preparing the Oil Phase [Phase B]

- ✓ In another beaker, add Shea Butter and melt it using a double boiler [~40°C].

Fig .15– Melting Process of Shea butter

- ✓ Add all the oils [castor, coconut, neem, grapeseed, almond, avocado, sunflower, curry leaves, hibiscus, onion] and mix well.
- ✓ Stir continuously to ensure uniform distribution.

Fig.16 – mixing of all oils

Step 4: Emulsification [Phase C - Blending Both Phases]

- ✓ Check the pH [ideal range: 4.5 – 5.5]. Adjust using more citric acid if needed.
- ✓ Add any coloring agent if you want.
- ✓ Pour the final emulsion into a spray bottle.
- ✓ Shake well before each use to ensure proper dispersion.

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Fig .18– spray bottle

- **Usage Instructions:**
  - ✓ Shake well before use.
  - ✓ Spray lightly onto damp or dry hair before heat styling.
  - ✓ Distribute evenly using a comb or fingers.
- **Formula for spray:**

Ingredients	Quantity [%]	Ingredients	Quantity [%]
Almond oil	8%	Hibiscus oil	5%
Coconut oil	13%	Honey	5%
Castor oil	5%	Propolis	5%
Onion oil	5%	Shea butter	5%
Neem oil	2%	Accacia gum	9%
Sunflower oil	8%	Aloe vera	12%
Carry leaves oil	5%	Vit. E	1%
Sandle wood oil	2%		

V. EVALUATION TEST

- pH test
- Skin irritation test
- Homogeneity test
- Spread ability test
  - ➢ **pH test:** The pH of the herbal spray was measured using both a pH meter and pH paper. The results indicated a pH range of 4.5-5.5.
  - ➢ **Skin irritation test :** A volume of 1–2 mL of the formulation was applied to the left hand and observed for 2 hours for any signs of redness, irritation, or inflammation.
  - ➢ **Stability Test at Room Temperature:** The stability of the product at room temperature was evaluated by storing it under ambient conditions for a period of 3 months and monitoring for any changes in physical appearance, consistency, or efficacy.[15,16]
  - ➢ **Homogeneity test:** A sample of the formulation was placed on an object glass and examined for uniformity. A homogeneous preparation should not contain any non-dispersed particles.

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- **Spread ability test:** The spread ability of the formulation was evaluated by applying it onto a transparent micaplastic surface. After one minute, the diameter of the spread area was measured to assess the extent of distribution. [24,25,26].

VI. RESULT AND DISCUSSION

Sr. No.	Parameters	Results
1.	Color	Light Purple
2.	Odor	Pleasant

1. **pH Test:**

Standard pH Range: Hair care products, especially leave-in treatments like heat protectant sprays, typically have a pH between 4.5 and 5.5 to match the natural pH of the hair and scalp and maintain cuticle integrity.

The herbal hair heat protectant spray showed a pH value between 4 and 5 using pH paper, and a precise reading of 5.35 using a pH meter. This confirms the product falls within the ideal range for hair care use.[17]


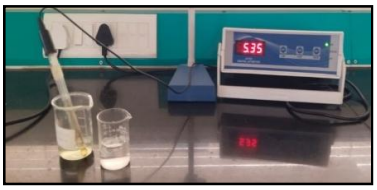

Fig .19– PH test

2. **Skin Irritation Test:** A skin irritation test was conducted by applying 1–2 mL of the herbal hair heat protectant spray to the left hand and observing for 2 hours. No signs of redness, itching, or inflammation were detected during the observation period. The result indicates that the product is skin-friendly and safe for topical application.[18]

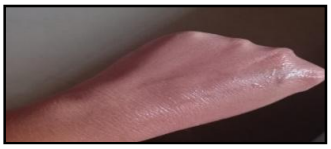
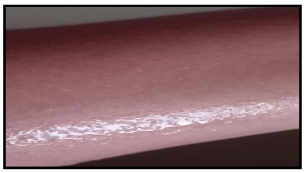

Fig .20- Skin Irritation test

3. **Homogeneity Test:**

The sample placed on a glass slide showed a uniform appearance under microscopic examination. No visible clumps or non-dispersed particles were observed. The formulation is considered homogeneous and well-dispersed.

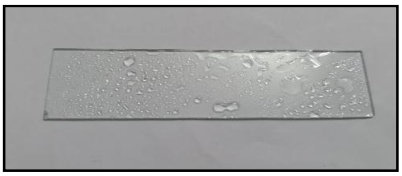
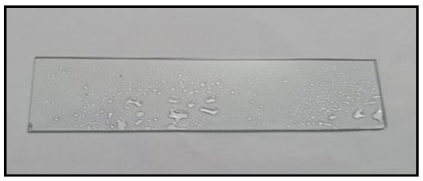

Fig.21 - Homogeneity Test

4. **Spread Ability Test:**

The heat protectant spray demonstrated good spreadability when applied to a transparent micaplastic surface. Within one minute, the formulation spread evenly, forming a circular area with an average diameter of 10 cm . This indicates efficient distribution, suggesting effective coverage when applied to hair surfaces.

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Fig.22 – Spread ability test

VII. CONCLUSION

In this study, an herbal heat protectant spray was made using natural ingredients that help protect hair from damage caused by heat styling tools. The spray worked well in reducing hair damage, keeping the hair smooth, and making it easier to manage. Ingredients like aloe vera, onion oil, shea butter, and hibiscus played an important role in protecting the hair and keeping it healthy. The spray was safe to use, did not cause any irritation, and had a pleasant feel. This shows that herbal products can be a good and natural alternative to chemical-based heat protectants. More research can be done in the future to test the product for long-term use and compare it with other market products.

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