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Formulation and Evaluation of Herbal Neem & Aloe Vera Based Anti-dandruff Shampoo

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Abstract: *This research focused on the development and evaluation of an advanced anti- dandruff shampoo harnessing the synergistic properties of Neem leaves and Tulsi. These botanicalwonders not only lend antimicrobial and anti- inflammatory attributesbut also enrich the formulation with their natural essence. Dandruff, a prevalent scalp disorder attributed to yeast overgrowth, particularly the presence of Malassezia fungus, prompted the need fora holistic solution.*

Conventional shampoos, laden with antifungal agents, often induce unwelcome side effects like hair loss and discomfort. In response, the formulation of a Neem-based anti-dandruff shampoo was undertaken, prioritizing a safer and healthier alternative tochemical-based counterparts. The herbal amalgamation incorporates Neem leaves extract as the active pharmaceutical ingredient for anti-dandruff efficacy, Tulsi leaves for their antimicrobial prowess, and Aloe vera r its moisturizing effects.

A comprehensive evaluation ensued, encompassing visual Inspection, foaming capacity, pH balance, viscosity, and foam consistency. The results not only validatethe efficacy of the formulated shampoo but also underscore its safety andholistic approach towards maintaining scalp health. This research endeavors to contribute tothe development of herbal alternatives, paving the way for a natural and effective solution to the persistent issue of dandruff.

Keywords: neem, Aloe vera, Lavender Oil, Tea tree oil

I. INTRODUCTION

The goal of anti-dandruff products is to stop the development of dandruff flakes. In both developed and underdeveloped nations, dandruff is a significant cosmetic issue. Malassezia restricta and M.globoso are two types of fungi that cause dandruff. It happens when epidermal cells on the scalp shed in bulk. About once every month, the scalp's skin regenerates. Dead cells are typically excreted from the scalp in a nearly imperceptible manner, but occasionally cell turnover becomes exceptionally rapid and dead cells are released as visible flakes, which is known as dandruff.

Shampoos are popular hair products that clean the hair and scalp and come in easy-touse packaging. Additional uses for shampoo include lubricating, conditioning, bodybuilding, preventing the buildup of static electricity, treating illnesses, and more. The final need is that the entire shampoo formulation be long-term medically safe[4]. The manufactured herbal anti- dandruff shampoo was superior to commercial herbal shampoo because it contains neem, a natural anionic surfactant with anti-microbial and preservation properties.

Aloe vera and Neem are medicinal plant they are used as traditionally from ancient year in various herbal medicines such Ayurveda, Siddha, and Homeopathic. Dandruff is major hair problem and a great public distress in India and in all over the world. Dandruff is one of the most common dermatological skin states and is a long noninflammatory state of the scalp that is characterised by overweening scaling of scalp tissue. Dandruff caused by a fungus called Malassezia restricta and M.globusa. Malassezia is also called pityrosporum is a yeast which is cause disinfection of skin.[1] Shampoos are most usually used in cosmetic product. Earlier soap cakes were used for washing hair, but now days both men and women's population mostly uses shampoos.

A shampoos may be defined as preparation of surfactant in a suitable form liquid, solid or powder which when used under the conditions specified will remove surface grease and skin debris from the hair. A good shampoo can directly form abundant foam irrespective of the type of water used or the nature of soil or fat to be removed from the hair. But mostly people always prefer a high foam shampoos.

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This makes the hairs too dry to handle or comb. So proper conditioning of hair is an also important fact. In another and in anatomical condition abnormal sebum from sebaceous gland called as seborrhea. This may lead to acne and psoriasis. The herbal shampoos are cosmetic preparation which are made by the traditional medical herbs and prepare for the cleansing of hair and dandruff free scalp.

They are used for the removal of oil, dirt, environmental pollution and dandruff. Dandruff is a chronic scalp condition leading to scaling, itching, and redness of the scalp by shedding epidermal cells. Some shampoos cause irritation to the eyes, these should be avoided. The herbal products presented in the market are contains herbal constituents such as plant extract and essential oils. Most frequently used of herbal ingredients in

LITERATURE REVIEW :

1. Studies on Neem's Antimicrobial Properties :

Neem (Azadirachta indica) is renowned for its antimicrobial properties, particularly against fungi and bacteria. Several studies have highlighted Neem's efficacy in inhibiting the growth of various pathogenic microorganisms. For instance, Neem extracts have shown significant antimicrobial activity against fungi such as Malassezia, which is commonly associated with dandruff. Neem's bioactive compounds, including nimbidin, nimbin, and azadirachtin, contribute to its antimicrobial effectiveness.

2. Research on Aloe Vera's Moisturizing and Healing Effects :

Aloe vera (Aloe barbadensis) is widely recognized for its moisturizing and healing properties. It contains polysaccharides, glycoproteins, and other bioactive compounds that promote skin hydration and wound healing. Aloe vera has been found to soothe irritated skin, reduce inflammation, and provide a cooling effect, making it a popular ingredient in dermatological applications. Studies have demonstrated Aloe vera's ability to enhance skin moisture and integrity, which is beneficial in managing scalp conditions like dandruff.

3. Previous Formulations of Herbal Shampoos and Their Evaluations :

The development of herbal shampoos has been driven by the need for natural and safer alternatives to synthetic products. Previous formulations of herbal shampoos have incorporated various plant extracts known for their therapeutic properties. For example, formulations containing Neem, Tulsi (Ocimum sanctum), and Aloe vera have been evaluated for their antimicrobial, anti-inflammatory, and moisturizing effects. These studies typically assess parameters such as foaming capacity, pH balance, viscosity, and the overall efficacy in managing scalp conditions like dandruff. The results often highlight the potential of herbal shampoos in providing a holistic and gentle approach to hair and scalp care.

AIM & OBJECTIVE :

Aim

To formulatiion and evaluation of neem and aloe vera herbal anti-dandruff shampoo is to create a safe and effective product that addresses dandruff, promotes scalp health, and avoids the use of harsh synthetic chemicals found in conventional shampoos

Objectives

- To compare the organisms isolated from the scalp with Malassezia furfur (MTCC no -1374)
- To check effect of individual component of shampoo the on growth of dandruff causing microorganisms
- Sub-culturing and maintenance of cultures of dandruff causing microorganisms
- To select herbs which are effective against dandruff
- To standardize extraction procedure for active ingredient of herbs
- To check the effect of herb extracts against Malassezia furfur
- Preparation of shampoo using effective herb(s)
- Determining shampoo’s inhibitory effects on dandruff causing microorganisms

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- Sample distribution and analysis of Feedback obtained
- Data Analysis and report writing

PLAN OF WORK :

Literature Review
↓
Classification of Dandruff
↓
Dandruff
↓
Cause of dandruff
↓
Herbal anti-dandruff shampoo
↓
Materials and methods
↓
Procedure
↓
Evaluation of hearbal shampoo
↓
Conclusion
↓
Result
↓
Reference

Benefits Of Hearbal Shampoo :

- More Shine
- Painless lice removal
- Reduce Dandruff
- Less Hair Loss
- Long Lasting Colour
- Stronger and More Fortified Hairs
- All Natural, No Chemicals
- Wont Irritate Skin or Scalp
- Pure and Organic Ingredient
- Free from Side Effects
- No Synthetic Additives
- Earth And Skin Friendly
- No Petroleum based Ingredients.

Dandruff :

Dandruff is a chronic scalp condition, which involves excessive shedding of dead skin cells from the scalp. It is caused by a fungus called Malassezia restricta and Malassezia globosa. Malassezia formerly called Pityrosporum is a yeast causing infection of skin and scalp.(13)Dandruff is caused due to excessive shedding of dead skin cells from the scalp. It affects 5% of the population and mostly occurs after puberty, between 20 and 30 years, and idandruff affects males more than females.(14) The skin of scalp renews itself about once a month. Usually, scalp sheds dead cells in nearly

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invisible way, but sometimes cell turnover becomes unusually rapid and dead cells are shed as visible flakes called dandruff. Warm and humid atmosphere, overcrowding, and poor personal hygiene promote the growth of Malassezia.

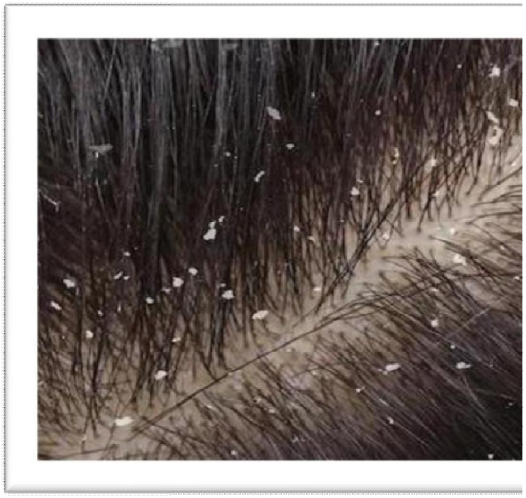

Fig.no.1

Function of shampoo :

2. Keep Healthy Natural Oils
3. It should effectively and completely remove dirt or soil.
4. It should effectively wash the hair.
5. It should produce a good amount of foam to satisfy the user.
6. It should be readily removed by rinsing with water.
7. It should impart a pleasant fragrance to the hair.
8. It should not have any side effects or causes irritation to the skin and eye.
9. Conditioning.

Classification of dandruff :

Depending upon the symptoms dandruff categorize-

1) Dry dandruff
2) Oily dandruff

1) Dry dandruff

A) It is also called pityriasis simplex characterize by excessive.

B) Information on the minute scale which accumulates on the scale area. C)

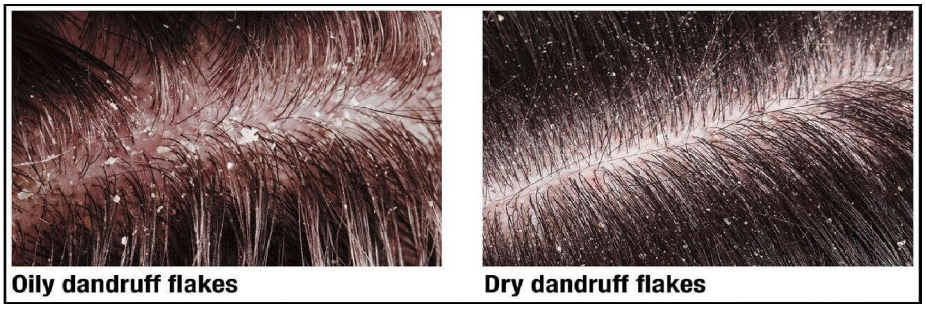

Fig.no.2 classification of dandruff

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2) Oily dandruff
A) It is also called pityriasis steroids.
B) It arrives on the scale with sebum production(11,12)

Different Diseases Associated With Scalp Hair :
- Mycotic Conditions
- Dandruff
- Seborrheic dermatitis
- Tinea capitis
- Parasitic Infestation
- Pediculosis capitis
- Inflammatory Conditions
- Psoriasis

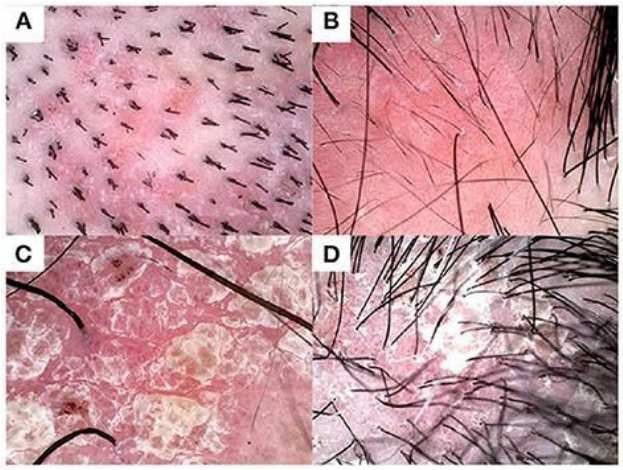

Fig.no.3

Causes of dandruff :

One explanation for dandruff is that the fungus Pityrosporum ovale, which is naturally present on the scalp and other parts of the skin. Typically, this fungus causes no damage. However, with the weather changes, hormonal, and stress, the scalp will produce more oil, causing the fungus P.ovale to proliferate. With the proliferation of the fungus, itchiness of the scalp skin cells and also the loss of hair follicles and so-called dandruff will come. The exact mechanism of dandruff formation is now believed to be the result of the formation of enzymes called lipases. The Malassezia fungusbreak down sebum to oleic acid by using these enzymes . The oleic acid then penetrates the top layer of skin and causes increased skin cell turnover in susceptible people. This, in turn, causes dandruff flakes and sometimes itching and redness

Symptoms of dandruff mainly include the following
- Presence of fragments (scaling)
- Itching of the scalp
- Redness around the scalp.

Herbal anti-dandruff shampoos :

Herbal anti-dandruff shampoos are the cosmetic formulations which contain herbal ingredients such as plant extracts and essential oil. These herbal shampoos are generally used to remove the dandruff, to add natural color to the hair, to

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remove the extra oil content of the hair, for the healthy growth of the hair, to remove the dust, dirt, and scales of the scalp, to prevent hair falling, to impart softness and smoothness to the hair shaft, etc. It is assumed that they can penetrate to the root shafts, stimulate the sebaceous glands, enhance the blood circulation and impart greater strength to the hair root and the shaft. They are also used against alopecia, thinning, clubbing, and graying of hair and hair shaft roughness and breaking. There are large numbers of plants which have beneficial effects on hair and are commonly used in shampoos (18)

Ingredients of a Shampooo

The common ingredients of a shampoo are:

- Detergents
- Conditioners
- Thickeners
- Preservatives
- Fragrance

Detergents: Shampoo generally include artificial detergents or surfactants as cleansers. A detergent or surfactant is amphiphilic in nature, which means the detergent molecules includes both lipophilic and hydrophilic sites. The lipophilic sites assist to bind sebum, oily dust and hydrophilic end binds to water.

Conditioners: Hair conditioning features are to impart manageability, gloss and residues of hair. This may be included in the shampoo which then serves dual function of cleaning and conditioning.

Thickeners: These are introduced to alternate the physical and optical properties of the shampoo. Many shampoos are pearlescent. Thickeners like sodium chloride are used to grow the product viscosity. These does not show any effect on hair cleansing.

Preservatives: Preservatives withstand germs and save us from decomposition of the shampoos. They also prevent various other health risks that accompany infection through germs and bacteria. Conditioners.

MATERIALS AND MATHODS:

Anti-dandruff shampoo with neem and aloe vera involves using these natural ingredients known for their beneficial properties for scalp health. Here's a general outline of the materials and methods typically used in formulating such a shampoo:

Materials Needed:

1. Neem Extract or Neem Oil:

Neem is known for its antimicrobial, antifungal, and anti-inflammatory properties, making it effective against dandruff-causing fungi and bacteria.

Fig.no.4

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2. Aloe Vera Gel or Aloe Vera Extract:
Aloe vera soothes and moisturizes the scalp, reducing itching and irritation. It also has antimicrobial properties that can help control dandruff.

Fig.no.5

3. Surfactants:
These are cleansing agents that form the base of the shampoo.
Common surfactants used in mild and natural shampoos include sodium lauryl sulfate (SLS) or its milder alternatives like sodium cocoyl isethionate or sodium laureth sulfate.
4. Conditioning Agents:
Ingredients like glycerin, panthenol (provitamin B5), or natural oils (e.g., coconut oil, argan oil) help moisturize and condition the hair after cleansing.
5. Preservatives:
Necessary to prevent microbial growth and maintain the stability and shelf life of the shampoo. Examples include phenoxyethanol, potassium sorbate, or sodium benzoate.
6. Thickeners:
Such as xanthan gum or guar gum, used to adjust the viscosity and texture of the shampoo.
7. pH Adjusters:
Citric acid or other acids to adjust the pH of the shampoo to a hair-friendly level (around pH 4.5-5.5).
8. Fragrance and Color (Optional):
Essential oils or fragrances may be added for a pleasant scent, while natural colorants like herbal extracts can provide a gentle hue.

Formulation Table :

Table No.1

Sr.no	Ingredients	Content
1	Neem extract	10ml
2	Tulsi extract	2ml
3	Aloe vera gel	2ml
4	Lavender oil	2ml
5	Tea tree oil	2ml
6	Liquid Castile soap	10ml
7	Water	q.s

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PROCEDURE:

1. Preparation of Herbal Extracts:

Neem Extract: Prepare neem extract by grinding fresh neem leaves or using neem oil. If using leaves, crush them and soak in water or alcohol to extract the active compounds. Strain to obtain the neem extract.

Tulsi Extract: Crush or grind fresh tulsi leaves to release their oils. Extract tulsi essence by soaking the leaves in water or alcohol. Strain to obtain the tulsi extract.

Aloe Vera Gel: Extract aloe vera gel from fresh aloe vera leaves by slicing open the leaves and scooping out the gel with a spoon. Blend the gel to achieve a smooth consistency.

2. Mixing the Shampoo Base:

In a mixing bowl, combine the liquid castile soap with distilled water in a ratio of approximately 1:1 or adjust according to desired shampoo consistency. Stir gently to blend.

Incorporating Active Ingredients:

Add the prepared neem extract, tulsi extract, and aloe vera gel into the shampoo base. Stir thoroughly to ensure even distribution of the herbal extracts.

4. Adding Essential Oils:

Incorporate lavender essential oil and tea tree essential oil into the shampoo mixture. These oils provide additional antimicrobial properties and a pleasant scent. Stir well to mix evenly.

5. Adjusting pH (if necessary):

Check the pH of the shampoo using pH strips or a pH meter. The ideal pH for hair care products is typically between 4.5 and 5.5. Adjust the pH if needed using citric acid (for lowering pH) or sodium bicarbonate (for raising pH).

6. Preservation (if required):

Depending on the shelf life and microbial stability of your ingredients, you may choose to add a natural preservative like potassium sorbate or opt for refrigerated storage and batch preparation for freshness.

Fig.no.6

7. Mixing and Testing:

Mix the shampoo thoroughly to ensure all ingredients are well combined. Perform a small-scale stability test by storing a sample of the shampoo in a sealed container at room temperature for a few weeks to ensure it remains stable and effective.

8. Packaging and Storage:

Transfer the finished herbal anti-dandruff shampoo into sterilized containers with tight-fitting lids. Label each container with the ingredients and date of preparation.

Store the shampoo in a cool, dry place away from direct sunlight to maintain its quality and efficacy.

The formulation were evaluated for different pharmaceutical parameter.

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EVALUATION OF HERBAL ANTI- DANDRUFF :

	F1	F2	F3
Physically appearance	Physically appear, good foam	Physically appear, good foam	Physically appear good foam
Odour	Lavender	Lavender Lavender	Lavender
Transparency	Not transparent	Not transparent	Not transparent
Colour	Yellowish green	Yellowish green	Yellowish green

SHAMPOO :

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as pH, density and foaming were performed.

Organoleptic properties-: We have done the visual inspection of product and observed that it was of-.

- Colour – Grinish colour
- Odour - Aromatic
- State - Liquid
- Consistency - Viscous

Determination of pH-:

The pH of formulated shampoo was 6.2. A formulated shampoo is acid balanced which is near to the skin pH. The pH of shampoo is important for improving and enhancing the qualities of hair, minimizing irritation to the skin and stabilizing the pH balance of the scalp. Mild acidity prevents swelling and promotes tightening of the scales, there by inducing shine.

Foaming Stability-:

The stability of the foam was determined using cylinder shake method. About 50 ml of formulated shampoo (1%) solution was taken in a graduated cylinder of 50 ml capacity and shaken for 10 times vigorously. Foam stability was measured by recording the foam volume of shake test after 1 min and 4 min, respectively. The total foam volume was measured after 1 min of shaking. From the consumer point of view, foam stability is one of the important needs of a shampoo. The foam volume produced by the formulated shampoo is above 10 ml. The prepared shampoo generates uniform, small sized, compact, denser, and stable foam

Surface Tension-:

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

Cleaning action-:

About 1 g of grease is spread on non-adsorbent cotton and kept in conical flask containing 1% shampoo solution. The conical flask is shaken for 1 hr in mechanical shaker. Cotton is collected, dried and weighed. The amount of grease removed is determined by observation.

Viscosity Evaluation :

Viscosity refers to the resistance of a fluid (solid, liquid, or gas) to deformation or flow. In the context of the formulated anti-dandruff shampoo:

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Rheological Evaluations:
These evaluations measure how viscosity changes with increasing concentration of the shampoo. Rheology helps understand the flow characteristics of the shampoo, indicating whether it pours easily or is more gel-like depending on its formulation.

Percentage Solid Content Determination:
Determining the solid content helps in understanding the composition and consistency of the shampoo:
Procedure:
1. Weighed 4g of shampoo was placed into a clean, dry evaporated dish.
2. Recorded the combined weight of the dish and shampoo.
3. After drying, calculated the exact weight of the shampoo by subtracting the weight of the dish.

Foam Stability Test:
Foam stability is important as it indicates how well the shampoo retains foam over time, which can affect user experience:

Foam Stability Test Procedure:
1. Prepared a 50ml solution of 1% shampoo in a 250-ml graduated cylinder.
2. Shook the solution 10 times.
3. Recorded the total volume of foam after 1 minute of shaking at room temperature (RT).
4. The height of the foam observed immediately after shaking provides an indication of foam stability.

II. CONCLUSION

The present study was carried out with the aim of preparing the herbal shampoo that reduces hair loss, strengthen the hair growth. Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair traditionally. To provide the effective conditioning effects, the present study involves the use of Shikakai, Amla, and other plant extracts. We formulated an herbal shampoo by using plant extracts which are commonly used traditionally and lauded for their hair cleansing actions. At this time, Hair fall is the major problem so in this case we try to add some type of herbal drugs in the formulation to prevents hair fall, make smooth, as well as give anti-dandruff action. The formulation of herbal anti- dandruff shampoo are given positive effect and reduce dandruff and other type of fungal infection from hair. This type of formulation we use Shikakai and Amla herbal plant which contain anti-dandruff property. There are no any type of side effect, so they are useful for all of them. The formulation of Anti-dandruff hair shampoo provides a method for treating a scalp dandruff or seborrheic dermatitis.

RESULT & DISCUSSION :

Result :
The focus of this research was the preparation and evaluation of a herbal anti-dandruff Neem shampoo.
The assessment encompassed various parameters, including physical properties, pH, viscosity, consistency, solid content, and foam stability.
Table 3, 4, and 5 present the positive outcomes obtained from the evaluation, indicating the efficacy of the formulated shampoo

Discussion :
The herbal shampoos are the preparations which are used for the washing and cleaning of hairs and to provide nourishment. The herbal shampoos are widely used due to their no or less side effects as compared to conventional shampoos, because it contains pure natural or herbal ingredients rather than synthetic chemicals. Herbal shampoo does not require animal testing and it is skin friendly. Herbal shampoo was formulated by mixing different Ingredients in

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specific proportions. Selected plant materials are rich in polyphenol compounds such as alkaloid, flavonoid, tannins and saponin. They have found to exhibit Anti hairfall, Anti dandruff, cleansing, moisturising and surfactant properties.

Physicochemical properties of the herbal shampoo were statistically evaluated. The effectiveness of herbal shampoo containing Ficus religiosa leaves, Hibiscus petals, Aloevera, Shikakai and Reetha can vary depending on several factors, including individual hair type and condition. While these ingredients are commonly used in ayurvedic and herbal hair care remedies, there is limited scientific research specifically on the

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