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"FORMULATION AND EVALUATION HERBAL ACTIVE ANTIDANDRUFF HAIR GEL."

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Abstract :-

This research paper explores the development of an antidandruff gel solution by combining flaxseed seed, hibiscus extracts, and aloe vera with Carbopol 934, PVP, and Methyl Paraben. Through rigorous experimentation and analysis, the study aims to create an effective remedy for dandruff. By blending natural extracts with modern pharmaceutical ingredients, the research seeks to offer a promising solution to tackle this common hair care issue. The process involves synthesizing the gel, assessing its properties, and evaluating its efficacy in combating dandruff. This innovative approach integrates traditional botanical elements with advanced formulation techniques to provide a potent antidote to dandruff.

By blending traditional botanical elements with advanced formulation techniques, this research seeks to offer a promising solution for addressing a common hair care concern.

The combination of aloe vera gel, hibiscus, and flaxseed seeds in an antidandruff gel can be beneficial for hair due to their complementary properties. Aloe vera is known for its soothing and moisturizing effects on the scalp, hibiscus contains antioxidants that promote scalp health, and flaxseed seeds are rich in omega-3 fatty acids which can nourish the scalp and hair follicles. When combined, these ingredients may work synergistically to combat dandruff and improve overall hair health without causing itching or irritation. However, the specific formulation and concentrations of these ingredients would determine their compatibility and effectiveness.

Keywords:-Carbapol 934,omega-3fatty acid, methyl paraben,

Introduction:-

Dandruff remains a common scalp ailment affecting individuals globally, with its persistent presence leading to discomfort and embarrassment. Despite the abundance of antidandruff products in the market, there exists a gap in the availability of formulations that harness the potential of natural ingredients while ensuring efficacy and safety. This research endeavours to bridge this gap by focusing on the development of a bioactive antidandruff gel formulated with a unique combination of flaxseed seed, hibiscus extracts, and aloe vera. These ingredients are chosen not only for their established therapeutic properties but also for their potential synergistic effects in combating dandruff and nurturing scalp health. By incorporating Carbopol 934, PVP, and methyl paraben, this study aims to optimize the gel's rheological properties, antimicrobial activity, and shelf stability, thus presenting a promising solution for individuals seeking effective and sustainable antidandruff remedies. Through meticulous formulation, characterization, and combination analysis, this research endeavors to contribute novel insights into the development of natural-based antidandruff formulations, catering to the evolving demands of consumers in the personal care industry.

Dandruff:-

Dandruff is a common condition where tiny pieces of dead skin flake off your scalp. It's usually caused by a combination of factors like dry skin, oily skin, or a kind of fungus that lives on everyone's scalp. While it's not usually harmful to your health, it can be annoying and embarrassing because it makes your scalp itchy and can show up on your clothes. It's like having little white flakes on your shoulders. If it gets really bad, it might make your scalp red and sore, but mostly it's just irritating and makes your hair look messy.

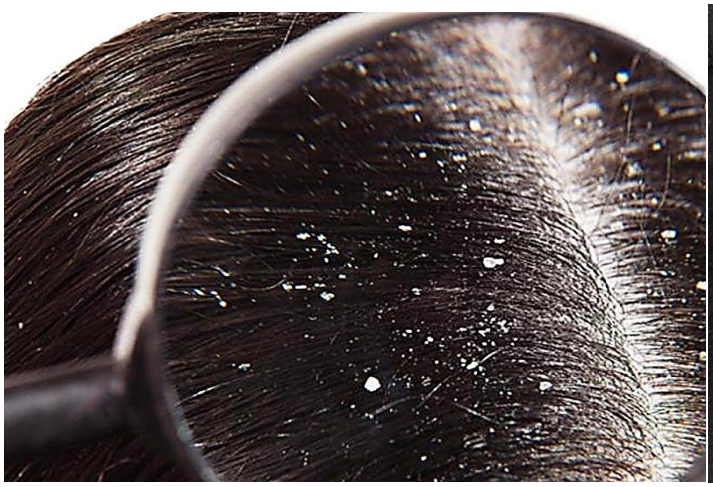
Causes of Dandruff: -

I. Skin microorganisms' metabolic waste products (mostly Malassezia yeasts)

II. Microorganisms like Propionibacterium and staphylococcus also have a significant influence in the development of dandruff.

III. Some of the negative effects of the synthetic medicines found in shampoos include (a)Mild skin itching, dry skin, unusual hair texture, scalp pustules, rash, headache, eye and skin irritation, damaged hair follicles, and hair loss are some of the symptoms listed in

IV. Synthetic scents may cause nausea, vomiting, hyperpigmentation, rash, and dizziness



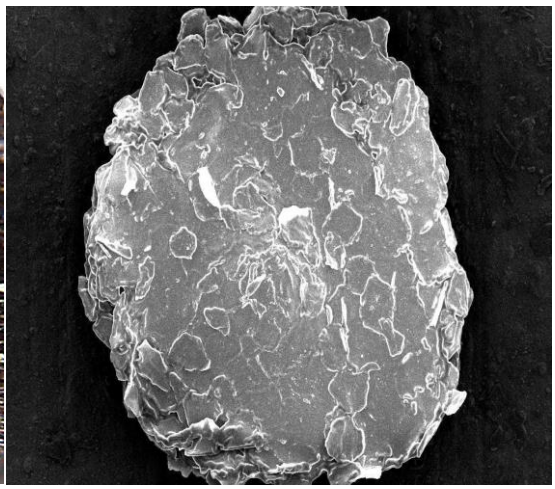


Fig1: - figure of dandruff

Fig2: - Figure of dandruff particle

Disadvantages of dandruff:-

1. Itching and irritation :- Dandruff often cause itching and irritation on scalp which can be distracting and uncomfortable.

2. Dryness or greasiness :- Depending on the type of dandruff, it contribute to either dryness or greasiness of the scalp, Leading to firther discomfort and aesthetic concerns

3. Potential for infection :- Contineous scratching of the scalp due to dandruff can lead to break in the skin, increasing risk of infection.

4. Hair damage :- Persists dandruff can weaken hair follicle and lead to hair breakage or thining over time.

5. Psycological impact:- Severe dandruff can cause psychological distress, affecting self-esteem and confidence level

Medicated Antidandruff Hair Gel:-

Dandruff is a common scalp condition characterized by the shedding of dead skin cells from the scalp, often appearing as white flakes in the hair and on clothing.

These gels often contain active ingredients such as antifungal agents, moisturizers, and soothing agents to address the underlying causes of dandruff, such as yeast overgrowth or dry scalp, while providing relief from associated symptoms like itching and irritation

Objective :-

The significant of pharmaceutical research and development is on the creation of therapeutic, prophylactic and diagnostic substance with specific functions and minimum side effects in particular of being for Morden medicine satisfying these condition.

Benefits :-

1. Anttibacterial Properties :-
Many bioactive ingredient posses' antibacterial properties which help to eliminate the fungi or bacteria responsibe for dandruff, promoting a healthier for dandruff, promoting a healthier scalp environment
2.Moisturizing and nourishing:-
Bioactive gels often contain moisturizing agents like glycerin or coconut oil, which hydrate the scalp and hair, preventing dryness and reducing the risk of flakes.
3.Soothing and calming: -
Ingredients like chamomile or lavender extract in bioactive gels can provide soothing relief from scalp irritation and inflammation, making them suitable for sensitive scalps.
4.Long-term scalp health:-
Regular use of medicated bioactive gels can improve overall scalp health, balancing oil production, reducing inflammation, and promoting hair growth.
5.Environmental friendliness: -
Many bioactive gels are formulated with environmentally friendly ingredients and production methods, making them a sustainable choice for conscientious consumers.

Material and Method:-

Material which are used for preparation of antidandruff hair gel :-

1.Aloe vera :-

Fig 3:- aloe vera plant

- Synonyms :- Aloe barbadensis, Aloe vulgaris, Aloe arborescence, Aloe ferox, Aloe perryi
  We use species of Aloe Barbadensis.
- Plant description :-

The aloe plant has long triangular, fleshy leaves that have spikes along the edges.

The fresh Parenchymal gel from the centre of the leaf the leaf is clear.

- Family:- Liliaceae
- Chemical constituent :-

Class	Compound	Properties
Anthraquinones	Barbaloin Isobarbaloin Emodin Aloetic acid	Aloin and emodin act as analgesic, antibacterial
Carbohydrate	Glucogalactomannan , Galactam Xylan, cellulose Pure mannan, acetyl mannan	A glycoprotein with antiallergic properties
Enzymes	Alkaline phosphatese, Amylase, bradykinase, Carboxypeptidase, catalase Lipase, oxidase	Bradykinesia help to reduce excessive inflammation when applied to the skin topically, whiles other help in breakdown of sugar and fats
Protein	Lectin, lectin like substance	It is inert substance, when included in topical preparation enhance penetrative effect
Vitamin	Vitamin ,B12,C,E, Choline and Folic acid	Vitamin A,C,E are antioxidant and antioxidant neutralise free radicle.

Table no. 1:-Compond and chemical constituent and properties of aloe vera gel

- Method :-

I. Selected a Mature Leaf: We Choose a thick, healthy leaf from the outer part of the plant.
II. Washed the Leaf: Rinsed the leaf under running water to remove any dirt or debris.
III. Trimmed the Spines: Used a sharp knife to carefully trim off the spiky edges of the leaf.
IV. Sliced the Leaf: Cut the leaf lengthwise to expose the gel inside.
V. Scraped the Gel: Used a spoon or a knife to carefully scrape out the gel from the leaf. Be gentle to avoid getting any of the green outer part of the leaf, as it can be irritating to the skin.
VI. Collected the Gel: Collect the gel in a clean container.

- Benefits:-

1. Healing properties
2. Antidandruff properties
3. cleanse oily scalp
4. Ease dandruff

2.Flaxseed Seed :-

Fig 4:- Flaxseeds

- Scientific name :- Linum usitatissimum
- Family:- Linaceae
- Collection of content :- we purchased flaxseed seed from the market store.
- Chemical constituents :-

Compound	Properties
Omega- 3 fatty acid	Moisturizing Anti inflammatory
Lignans	Anti- inflammatory Antioxidant
Phenolic compound	Antioxidant, may help protect from environmental damage
Phytosterol	Soothning Anti -inflammatory
Vitamin E	Nourishing for skin Antioxidant

Table no. 2:- Compond and chemical constituent and properties of Flaxseed

Method :-

collected the flaxseed seed from purchased from market

then measured 15g of flaxseed seed from the stocked content

then boiled the 15g of flaxseed seed with 45ml of water until mucilage was obtained

then filtered this mucilage with thin cloth

Benefits :-

1.Nourishesh the scalp, strengthen hair follicles

2.Moisturizes scalp , helping to alleviate dryness

3. Improve elasticity of hair

4. Help to soothe irritated scalp conditions.

3. Hibiscus :-

Fig 5:- Hibiscus

- Synonym :- Hibiscus arnotii Griff. Ex Mast, Hibiscus boryanus Dc, Hibiscus cooperi auct,
- Common name :- China- rose, Chienese hibiscus, Hibiscus, rose- of -China
- Kingdom :- Plantae-plants
- Subkingdom :- Tracheobionta- Vascular plants
- Family :- Malvaceae
- Genus :- Hibiscus L-Rosemallow
- Species :- Hibiscus rosa sinensis L.shoeblackplant
- Collection of flower :- We collected hibiscus flower from college garden.
- Chemical constituents:-

Class	Compound	Properties
Flavonoid	Anthocyanins	Antioxidant properties Protection from UV
Polyphenol	Polyphenols	Anti-inflammatory Soothing irritated skin
Vitamin	Vitamin c Vitamin E	Collagen production Antioxidant Brightening Promote blood circulation Prevent breakage of hair
Fatty acid	Omega 6 fatty acid Linoleic acid Oleic acid	Moisturizing Strengthening skin barrier Antiinflammatory Moisturising Anti-aging effects
Carotenoid	Beta- Caretenoid	Skin rejuvenation

Table no. 3:- Compond and chemical constituent and properties of Hibiscus

- Plant Description:- Hibiscus rosa sinensis commonly known red hibiscus. It is large shrub and has variable structure. It may be upright or broad and spreading. The tree grows up to 4.7 meter tall. The petals may be smooth or scalloped, single or doubled. The anther which is pollan producing part can be seen part way up the column and five round stigma lobes are visible at tip of the column.
- Collection of content :- We collected hibiscus flower from garden of college.
- Method :- Prepared extract from the hibiscus

I. first, we dried the petals of hibiscus until it completely become dried then we convert it in to powder form

II. Then in a beaker, we added a solvent such as water and glycerine then placed the powder of hibiscus powder into it. We then store this mixture up to the 5 days , to facilitate extraction.

III. After the extraction process, we filtered the mixture to separate the liquid extract from the solid residue. The filtrate containing the hibiscus extract was collected in another clean beaker.

IV. Finally, we stored the extracted hibiscus solution in a labelled container for further analysis or use various application

Fig.6 :- Extraction of hibiscus

Benefites:-

1. Promote hair growth
2. Strengthens hair strands
3. Reduce dandruff by moisturizing the scalp
4. Improve texture of hair

Preparation of hair gel :-

A. Formulation of base

Weighed the polyethylene glycol 0.35ml,methyl paraben 0.09mg,and glycerine 15ml

↓

Then add aloe vera gel 1g in that beaker

↓

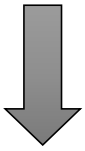
Dissolve it in 20ml of water

↓

Then above mixture was stirred by using mechanical stirrer at high speed up to 800 rpm

↓

Appropriate quantity of 1.5gm Carbopol 934 and 1mg of polyvinylpyrrolidone (PVP) were added slowly in the beaker containing above mixture of solvent with continuous stirring



Then 0.2ml triethanolamine (gelling agent)was added slowly with continuous stirring until gel was obtained

In this way prepared 4 different formulation of hair gel base in which the concentration of Carbopol 934 were changed. Prepared 4 different concentrations of containing Carbopol hair gel base formulation like F1,F2,F3,F4 and these different formulation concentration. These above formulation stored at room temperature for 24 hrs. until further evaluation after storing for 24 hrs from above 4 gels the F3 gel Carbopol gel base formulation containing 1.5gm Carbopol 934 showed smooth and thick too thick gel to handling and it is perfect as compare to other concentration. So, among these formulation the F3formulation which contain 1.5gm Carbopol is result good so it was carried out or further studies. The gel formulation was better observed after 24 hrs. The F3 gel preparation containing 1.5g of Carbopol 934 were formed unchanging and smooth gel, that did not liquify and the appearance is also unchanged even 24 hrs

Fig 7 :- mixture is stirred by mechanical stirrer

Fig.8:- Formulation of base formulation on the basis of four different concentration of carbopol 934

Batches Formulation of hair gel base

Formulation code	F1	F2	F3	F4
Carbopol 934 (g)	0.5	1	2	2.5
PVP (mg)	2	2	2	2
Methyl paraben (mg)	0.09	0.09	0.09	0.09
Glycerine (ml)	15	15	15	15
PEG (ml)	0.35	0.35	0.35	0.35
Triethanolamine (ml)	0.2	0.2	0.2	0.2
Water (ml)	20	20	20	20

Table no.4 :- Baches formulation for antidandruff hair gel base by taking different concentration of carbapol 934

Batches Formulation of Bioactive hair gel

Name	H1F3	H2F3	H3F3	H4F3
Flaxseed mucilage %	2.5	5	7.5	10
Hibiscus extract %	2.5	5	7.5	10
Aloe vera gel (g)	1g	1g	1g	1g
Hair gel base	F3	F3	F3	F3

Table no.5 :- Baches formulation for antidandruff hair gel by taking different concentration of bioactive ingredients

Evaluation of Herbal gel baches :-

Properties	F1	F2	F3	F4
Colour	Pale yellow	Yellow	Dark yellow to slight brown	Brown
pH	7.2	6.9	6.5	6.1
Viscosity	Fair	Good	Excellent	Fair
Homogeneity	Fair	Good	Excellent	Good

Table no.6 :- Evaluation testing results of baches formulation of antidandruff hair gel

Fig. 9: Baches formulation of antidandruff gel

There are 5 formuation contents mentioned in table 2 these different formulation are stored at room temperature , until further evalution after 24 hours among above these formulation the H3F3 formulation is have excellent pH , viscosity homogeneity and physical appearance

2. Addition of flaxseed and hibiscus extract, neem powder in hair gel base :-
Add flaxseed seed mucilage in hair gel base formulation with continuous stirring
Then add extract of hibiscus and stirred well mixture
To obtain proper consistency transfer this mixture in the mortar pestle and agitate it con-tenuously
After obtain proper consistency and mixed well the transfer into the well packed container and store dry place.

Fig.10:- Agitating gel in mortar pestle

Fig.11:- Final product of antidandruff hair gel

Optimized Formulation table:-

Sr No.	Name of Ingredient	Quantity taken	Function
1.	Aloe vera(g)	1	Moisturiser, Antifungal
2.	Hibiscus(%)	7.5	Provide Lustre
3.	Flaxseed seed(%)	7.5	Omega-3 fatty acid Nutrient rich
4.	PEG (ml)	0.35	Emulsifier Solubilizing agent
5.	Glycerine(ml)	0.09	Humectant
6.	Methyl Paraben(mg)	0.18	Preservative
7.	Polyvinyl propylidene(mg)	1	Film forming agent
8.	Tri ethanol Amine(ml)	0.2	pH adjuster
9.	Carbopol 934(g)	2	Gelling agent
10.	Water	q.s.	Vehicle

Table No. 7:-Optimized formulation table

Evaluation study :-

1. Physical characteristics :-

Physical parameter was visually checked for the appearance, colour, and the odour application of prepared base gel formulation.

- **Colour:-** slight brown
- **Odour :-** odourless
- **Appearance :-** smooth and homogeneous

2.Stability checking :-

Stability of gel is checked by store it in high temperature site and also extremely lower temperature for 12 hours then it checks there is no difference in that colour, texture ,

There are we check Two types of stability :- 1. Physical stability

2. Chemical stability

3. Thermal stability

1. Physical stability :-

- Uniformity:- Ensuring consistent distribution of ingredient throughout the gel.
- Homogeneity :-Maintaining a visually appealing appearance without clumps or uneven texture.

2.Chemical stability :-

- Ingredient compatibility:- Selected component that do not react negatively with each other ,preserving their efficacy.
- Antioxidant :- Incorporated antioxidant to prevent degradation of active antidandruff agent due to oxidation

So, after checking it it's this test is passed by antidandruff hair gel because of antioxidant is adding.

- pH control:- Maintained the appropriate pH level to stabilize active ingredient and minimize chemical reaction by adding triethanolamine ,and there is no change of pH level as time passing.

3.Thermal stability :-

- Thermal stability was evaluated by subjecting the hair gel to a 12-hour period of exposure to hot summer conditions. Following this test, it was observed that the gel remained unchanged, indicating its robust thermal stability. This result underscores the formulation's ability to withstand elevated temperatures without compromising its integrity or efficacy. Such resilience ensures that the gel maintains its effectiveness even when exposed to challenging environmental conditions, providing consumers with a reliable antidandruff solution regardless of whether fluctuations.

3.Texture test :-

To evaluate the gel texture by applying it to palm of the hand and assessing if it feels sticky, greasy or lightweight.

4.Irritation test :-

We select 10 volunteer and apply 0.5 ml bioactive antidandruff gel on their hand for 1 hour and after wash it there is no red rashes and any skin irritation is observed and feel by these 10 volunteer .

5.Safety :-

Conducted safety test to ensure the product is nontoxic and suitable for use on scalp and hair

We select 3 volunteer and which have different types of hair and then we applied our product on their hair and wait for 15 min and then washed out with regular shampoo then there is no obtained any toxic effect on hair scalp.

6.Spreadability :-

The weighed quantity of gel (about 0.5) was sandwiched between two glass slides. 0.5g of weight was placed on the slides. The weight was removed for a specific period of 10min. The weight was removed, and the diameter of the spread circle was measured at different points.

Spread ability was calculated using the equation

$$S=(M\times L)/T$$

S is the spread ability in g·cm/s,

M is the weight in grams required to pull the slides apart,

L is the length in centimeters of the slide separation, and

T is the time in seconds taken to pull the slides apart

Then we have,

M = 0.5 g (weight removed),

L = 5 cm (length of the slide separation), and

T = 10 min = 600 seconds (time taken to pull the slides apart).

Now, we can calculate the spread ability:

S = (0.5 g × 5 cm) / 600 s

S = (2.5 g·cm) / 600 s

S ≈ 0.00417 g·cm/s

This result indicates that the antidandruff hair gel has good spread ability, as it can cover a considerable distance (in this case, 0.00417 g·cm/s) within a specific time frame, facilitating easy application and distribution on the scalp.

7.Washability Test:-

Determine how easily the gel washesh out of hair with water

For water removal testing we applied 0.5 ml of gel on the glass slide and spread homogenously then hold in running water and after 2 min there is no extract of gel present on the slide all gel is removed by water. It means it completely removed by water

8. Homogeneity :-

After the gel formulation have been set in container , all developed gel tested for homogeneity by visual inspection. They were tested for their appearance and presence of any lumps, flocculates or aggregates

9.Viscosity testing :-

- Spatula Method:

Use a clean spatula to scoop a small amount of the hair gel.
Observe how the gel flows off the spatula.
Note the rate of flow and the gel's consistency (e.g., thick, thin, sticky).

- Finger Rub Method:

Take a small amount of hair gel between your fingers.

Rub your fingers together to spread the gel.
Note the resistance and feel of the gel as you rub your fingers together.

- Pouring Test:

Pour a small amount of the hair gel from its container.
Observe how the gel flows out of the container.
Note the speed and smoothness of the pouring process

- Visual Observation:-

Simply visually inspect the gels consistency in its container.

Note if it appears thick, thin or has any noticeable changes in texture.

10.pH test :-

We tested our antidandruff hair gel, by using digital pH meter and we found its pH is 6.5 which is suitable for scalp and hair.

Fig.12:- Testing of pH of antidandruff gel by using digital pH meter

Result :-

Physical appearance:-

The colour of all the herbal gel formulation found to be brown which was found to be smooth on application.

Homogeneity :-

The developed gel was verified for homogeneity by pictorial appearance and presence of any flocculates and lumps. The homogeneity was excellent for gel formulation

Ph determination :-

The pH of the herbal gel preparation ranged between 6.7 to7.3 that suited the hair.

Viscosity determination :-

Viscosity of herbal gel was determined by pour method, Spatula method, Finger rub method and that was found excellent viscosity

Washability :-

The prepared hair gel was applied on hand and washed in water. After washing there is no trace of gel.

Spread ability :-

Spread ability play an important role in consumer acceptability and help in uniform application. Spread ability was found is S ≈ 0.00417 g·cm/s and it is good separability.

Texture testing:-

Texture was found by applying on hand and it found sticky, greasy or lightweight.

Stability testing:-

Stability was found after store in it summer sunlight for 24 hours and placed for 24 hours in fridge there is no crack was found in bioactive herbal gel and there is no major change in viscosity and no floccules are formed.

Conclusion:-

The flaxseed hair gel formulation provides a tremendous effect on scalp and strengthens the hair due to presence of bioactive such as nutrient provider Flaxseed , lustre and scalp infection treater Hibiscus and dandruff remover Aloe vera. Bioactive hair gel is prepared by simple boiling method, so it is less in cost and easy to handle. In hair gel there is flaxseed, hibiscus and aloe vera also added so this antidandruff gel synergetic effect because aloe vera and flaxseed also give antidandruff effect. The evaluation of antidandruff gel is done by performed by some test that is physical appearance, homogeneity, stability , spread ability ,washability, irritation test.the evaluation test confirm that the hair gel is compatible with hair and its side effects is in limited range.

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