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DESIGN AND DEVELOPMENT OF AN ANTI-FUNGAL HAIR SERUM WITH HERBAL INGREDIENTS

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ABSTRACT:

Cosmetic serum is a highly concentrated product based on water or oil. When using concentrates, we get not only a quick cosmetic effect, but also physiological satisfaction after the treatment because the result will be seen practically immediately. Serum has property of rapid absorption and ability to penetrate into scalp, together with its non-greasy finish and intensive formula with a very high concentration of active substances. Based on its properties, the aim of this work was to formulate a serum for treating dandruff using poly herbal extract. Dandruff is a fungal disorder on scalp caused by seborrheic dermatitis. The main anti-fungal ingredient present in this formulation is ginger contain gingerol. Here the antifungal hair serum was formulated with various concentrations of ginger juice, green tea, aloe vera, Rosemary water, rosemary oil, and coconut oil. The most stable formulation was tested for antifungal activity by potato dextrose agar plate and its physical appearance, pH, viscosity, spread ability, and wash ability was also evaluated. By using anti-dandruff serums, can improve scalp health and therefore gain healthy hairs. These scalp serums tackle flaking, soothe irritation, and promote a healthy scalp environment, ultimately leading to healthier, more manageable hair.

KEY WORDS: Anti- fungal, Serum, Dandruff, Herbal extract, Hair, Cosmetics

INTRODUCTION:

Definition:

Cosmetics are defined as any substance that is intended to be administered to the human body or any part of it by rubbing, pouring, spraying, or sprinkling in order to cleanse, encourage beauty or alter appearance., This includes any substance that is meant to be used as a component of cosmetics. [1]

History:

The timeline that follows provides a quick overview of the history of cosmetics, starting with the Ancient Egyptians in 10,000 BC and ending with more recent advancements in the US.

The phrase "cosmetae" was originally used to describe slaves in Rome who were employed to give fragrant baths to both men and women. In ancient Egypt, both sexes used scented oils. As early as 10,000 BC, they used ointments to hide their body Oduor and soften and cleanse their skin. Paints and dyes were used to color the hair, skin, and torso. [2]

They rouged their lips and cheeks, heavily lined their eyes and eyebrows with kohl, and drew henna on their nails. Burnt almonds, lead, oxidized copper, ochre, ash, malachite, crushed antimony, or chrysocolla (a blue-green copper mineral) might all be combined to make kohl, a dark powder. To apply it, they used a little stick. The almond effect was achieved by painting the upper and lower eyelashes in a line that extended to the sides of the face. In addition to reducing sun glare, kohl eyeliner was believed to minimize eye infections and enhance vision. Kohl was kept in a little pot with a flat bottom, a wide, thin rim, and a flat, disk-shaped top.

In 1888, an unidentified Philadelphia developer created cosmetic deodorant, which was patented under the Mumm brand. Cosmetics gained popularity in the United States and Europe in the early 1900s due to the influence of ballet and theatre performers. In 1900, black entrepreneur Annie Turnbo began selling hair products, such as non-damaging straighteners, conditioners, and hair growth, door-to-door. In 1915, lipstick first appeared in metal tubes that were cylindrical. [3]

Classification of cosmetics:

I. **According to their use:** [4]

1. Nails: Nail lacquers, Nail polish, Polish removers.
2. Skin: Powders, Lipsticks, Creams, Rouge, Lotions.
3. Hair: Shampoo, Conditioners, Shaving preparation.
4. Teeth: Powder, Paste, Gel, Dentifrices.
5. Eyes: Eyeliner, Mascara.

II. **According to function:**

1. Emollient: Cold cream, Vanishing cream.
2. Cleansing preparation: Cream, shampoo.
3. Decorative preparation: Lipstick, Eyeliner.
4. Deodorant: Spray, Stick, Roll-On.
5. Protective: Creams, Powders.

III. **According to their physical nature:**

1. Powders: Talcum powder, Tooth powder.
2. Emulsions: Cold cream, Liquid cream.
3. Sticks: Lipsticks, Deodorant sticks.
4. Sprays: Perfumes, Shaving spray.
5. Jellies: Hand jelly, Hair jelly.
6. Oils: Hair oil, Body oil.
7. Pastes: Toothpaste, Deodorant paste.

Hair:

Protein filaments called hair originate from dermal follicles. A distinguishing feature of animals is their hair. The follicles that create fine vellus hair and dense terminal hair are found throughout the human body, with the exception of glabrous skin patches. [5]

Structure:

Hair is made up of two different frameworks:

1. A hair follicle is the live part that is located under the skin.

    1. The hair shaft—the completely keratinized, inanimate portion above the epidermis The muscle of the arrector pili divides the region of the hair bulge from the dermoepidermal junction.

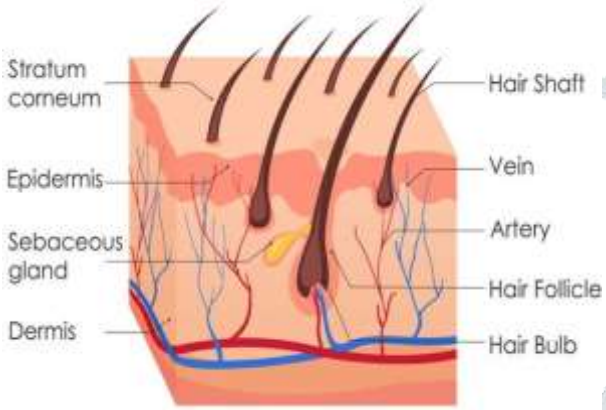


Fig: 1

The three layers that comprise the hair shaft are the cuticle, cortex, and sometimes the medulla.

1. ***Cuticle:*** Tightly attached to the cortex cells proximally are cuticle cells, which are square and flat in shape. Additionally, cuticle serves as a barrier and has significant protective qualities against chemical and physical harm.
2. ***Cortex:*** *Bundles of keratin in cell architecture* that maintain a crudely shaped like a rod are found in the hair's central layer Provide the hair fiber with strength, color, and structure. The cortex is where pigment response and melanin are present.
3. ***Medulla*****:** Ideally seen in coarser fibers, and it is in the center of the layer. Compared to other hair keratins and eosinophilic granules, the structural proteins present in the hair medulla are very different. Packed with the amino acid citrulline, these granules eventually form internal coats inside the membranes of mature cells. [6,7]

Growth cycle:

Every hair in the follicles begins as a hair bulb. Cell division occurs in a tiny factory called the hair bulb. An increasing number of cell divisions force the older cells out of the hair bulb, which develops into a hair shaft.The three stages of this cycle are telogen (rest), catagen (transition), and anagen (growth).

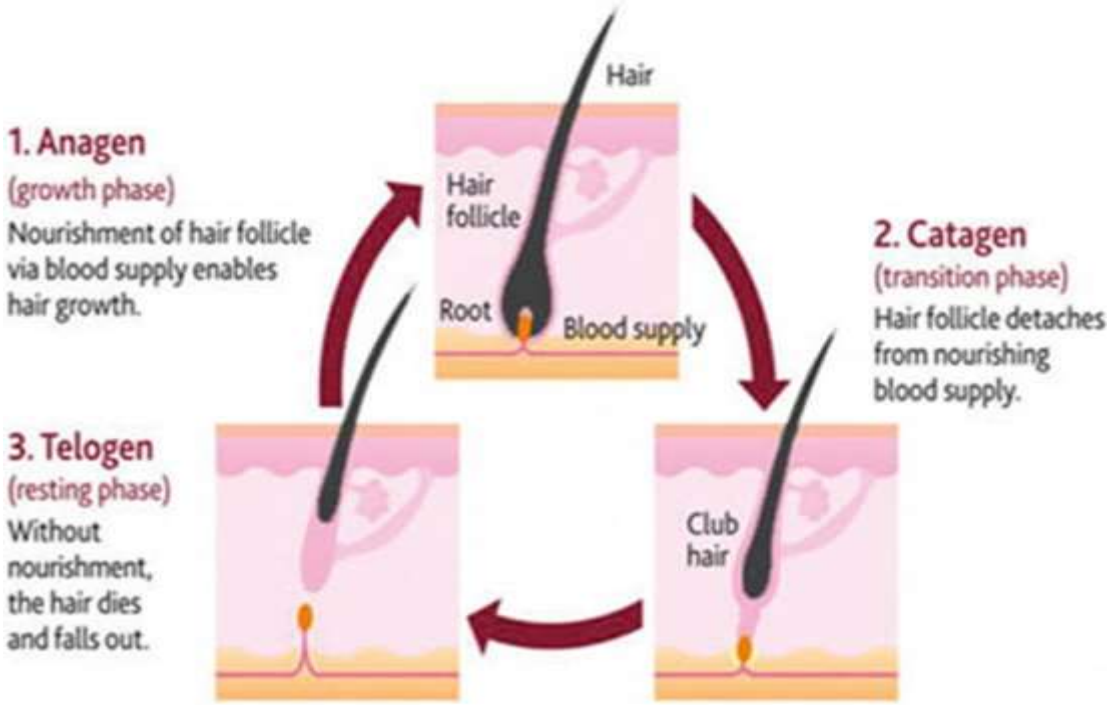


Fig:2[8]

1. ***Anagen:*** This is the growing stage. Rapid cell division causes the older dead cells outside the bulb to become keratinized, which starts the formation of baby hair. About three years pass during the Anagen period. Each hair typically grows half an inch every month. 85% of hair follicles are in the growth phase at any given time.

2. ***Catagen:*** The resting or transitional phase is known as catagen. When the hair reaches the Catagen phase, it ceases to grow and remains there for approximately one month. At this point, the hair follicle that gave rise to the hair strand begins to contract. But the hair stays in place for a while and doesn't fall out. An average of 1% of hair is in the Catagen phase, or resting phase, at any given time.

3. ***Telogen*****:** Also referred to as the falling phase, telogen is the last stage. The adult hair starts to fall out at this point. This stage lasts roughly three months. The hair follicles return to the Anagen, or growth phase, when the hair falls out. About 10% of hair is in the telogen phase at any given moment. [9]

Problems associated on hair & scalp:

Hair loss

Historically, hair loss has been primarily linked to men, although it can also affect women. Stress, medicine, hormone fluctuations, and even menopause are frequently cited causes of female hair loss. Moreover, using different hair style products might exacerbate hair loss. [10]

Fig:3

Dry Hair

Excessive shampooing results in dry hair. While having perfectly clean hair might be beneficial, many people overdo it by washing it just once, twice, or even daily, which removes all of the natural elements of the hair. [11]

[Fig:4]

Split Ends

Split ends are caused by excessive perming, excessive brushing, excessive heat, and inadequate conditioner.

Fig:5

Greasy or oily hair

When the scalp generates too much sebum, a natural oil, it results in oily hair. The sebaceous glands that create sebum can occasionally "work overtime," resulting in an overabundance of oil.

Dandruff

It is a prevalent ailment that results in flaking of the scalp skin. One mild type of seborrheic dermatitis is dandruff. Infants with seborrhoeic dermatitis are referred to as having "cradle cap.". [12]

Fig:6

TYPES OF DANDRUFF

1. Dry dandruff: This condition known to be brought on by pityriasis simplex, is characterized by an overabundance of tiny, white, grey, or ash-colored scales that build up on the scalp. [13]

2. Oily dandruff: Pitryasis steatoides, another name for oily dandruff, is another type of dandruff. It appears on the skin of the scalp with varying levels of sebum production. It mostly affects young guys who are about to enter puberty. Along with the appearance of oily, dirty yellow scales that will eventually form lesions, the scalp skin becomes inflamed to varying degrees.

Symptoms

It could consist of:

1. Skin flakes on the shoulders, beard, eyebrow, hair, and scalp
2. Scalp itching
3. Scaly, crusty scalp in cradle cap babies [14]

Prevention

1. Control Stress: Stress has an impact on one's general health and increases one's vulnerability to various illnesses. In fact, it may exacerbate pre-existing symptoms or possibly cause dandruff.

2. Eat a Balanced Diet: Dandruff may be avoided by eating a diet high in zinc, vitamins B, and lipids.

3. Frequently Shampooing: Daily shampooing might help avoid dandruff if a person has an oily scalp.

4. Get Enough Sunlight: Dandelions may be lessened by exposure to sunlight. However, sunbathing should be avoided because UV radiation exposure harms the skin and raises the chance of developing skin cancer.

***5. Limit hair styling products*:** These products can accumulate on the scalp and hair, causing them to become oilier.

Intervention

1) ***Coconut oil:*** massage three to five teaspoons into the scalp, let it sit for an hour, and then shower your hair.

2) ***Aloe Vera:*** Apply a small amount of aloe Vera to the scalp right before shampooing your hair.

3) ***Apple Cider Vinegar:*** Apply a mixture of a quarter cup water and apple cider vinegar on the scalp. After at least fifteen minutes, thoroughly cleanse your scalp.

4) ***Lemon juice:*** Apply two teaspoons of lemon juice to the scalp, then rinse after a few minutes of rest. Next, combine one cup of water with another teaspoon of lemon juice, then apply the *mixture to the scalp.*

5) ***Olive oil:*** *Dab the scalp with a few drops of olive oil, cover the hair with a shower cap, and then take a sleep on it. In the morning, shampoo your hair.* [15]

Hair serum:

A hair product that is put on hair is called hair serum. A liquid substance for hair care is hair serum. Water is not as thick as it is. Hair serums are styling solutions with a silicone base that apply a layer to your hair's surface to add extra softness, luster, and hydration. [16]

Fig:7

Hair serum's salient features include:

- It is a styling treatment that coats the hair's surface in a protective layer.
- It functions effectively as a liquid hair care solution, having a denser viscosity than water.
- The silicone used in the formulation of this style solution adds a protective coating to the hair's surface while also improving its hydration, gloss, and smoothness. It offers protection from pollutants and humidity as well. [17]

Advantages of Hair Serum:

- Hair serums are an efficient way to soften, smooth, and silken hair while protecting it from

environmental aggressors.

- It serves as a pre-styling treatment and a final product, and it may be applied both before and after heat styling. minimizes frizz.

- Avoid frizz.
- if you have damaged and fragile hair. makes things smoother.
- The appearance of hair serum is further enhanced by its anti-frizz qualities.
- Additionally, hair serum boosts shine and lessens knots.
- It protects against damage and enhances curls and straightness. [18]

Disadvantages of Hair Serum:

- Excessive application and frequent use might make hair brittle and dry.
- The scalp serum may result in allergies, irritation, and inflammation.
- The hair serum's silicones may be bad for long hair. It may cause hair breakage.
- Avoid applying anything to the scalp as it may cause inflammation or make it oily. [19]

Types of hair serum:

Herbal hair serums come in a variety of forms, each of which supplies blood to the scalp and is tailored to address certain hair problems and preferences. Some common types of herbal hair serums are as follows. [20]

Serum for moisturizing:

The purpose of these serums is to moisturize brittle, dry hair. The nutrients included in herbal ingredients, such Since they moisturize and nourish the hair strands, coconut oil, shea butter, argan oil, and aloe vera make them feel silky and smooth and easier to maintain.

Serum that promotes growth:

The two primary objectives of these serums' compositions are to promote hair growth and density. They may contain substances that stimulate follicles, such as biotin, ginseng extract, fenugreek extract, and others that promote hair development.

Strengthening serum:

Weak, damaged hair is strengthened with strengthening serums to promote healthier-looking hair and avoid breakage. Horsetail extract, nettle leaf extract, and rosemary oil are among the antioxidant-rich herbs, vitamins, and minerals that are frequently found in them and help to strengthen and resilient hair.

Anti-dandruff serum:

Serums that combat dandruff and other scalp issues like flakiness and itching are called anti- dandruff serums. Their antibacterial and anti-inflammatory properties are often derived from herbal components including peppermint oil, neem oil, and tea tree oil. These components aid in calming the scalp and reducing the dandruff-causing germs.

Color-preserving serum:

Color-protecting serums are designed to preserve the radiance and resilience of color-treated hair. They usually contain herbal compounds like sunflower seed oil, grapeseed oil, and green tea extract, which help stop UV rays and environmental harm from fading hair color.

Soothing serum:

Soothing serums are meant to calm and soothe the scalp, which will reduce irritation and inflammation. To help relax and lessen scalp irritation, they may contain herbal substances like calendula extract, lavender oil, and chamomile extract that have calming and anti-inflammatory properties. [21]

Serums for smoothing:

These serums are designed to minimize frizz, make hair fly away, and make it appear sleek and smooth. They usually contain substances like silicone or argan oil to coat the hair shaft and give it a smooth texture.

Shine serums:

The purpose of shine serums is to provide brightness and luster to lifeless hair. They usually contain oils like coconut or jojoba oil or light-reflecting particles to add shine without making the hair seem heavy.

Heat protectant serum:

These serums act as a protective layer to shield hair from heat-producing hair styling equipment including blow dryers, flat irons, and curling irons. They usually employ silicones or other heat- protective materials to lessen the damage that heat styling causes.

PLANT PROFILE:

ALOE VERA

Synonym:

Aloe, Musabbar, Kumari

Biological source

Aloe is derived from the dried juice of the leaves of *Aloe barbadensis Miller*, a Liliaceae plant. [22]

Fig:8

chemical constituents:

Anthraquinone glycosides are mostly found in all species of aloe. Alloin is the primary active component of

aloe, with barbaloin being the most abundant. Aloe also includes isobarbaloin, beta barbaloin, aloe-emodin, resins, chrysophanic acid, chrysamminic acid, aloesone, homonataloin, and aloetic acid, among others. [23]

Uses

- Aloe Vera contains a lot of minerals and active compounds that can help make your hair stronger.
- Because it contains enzymes that break down fats, it removes excess oil (sebum) from your hair.
- It has the ability to prevent dandruff.
- It might considerably lessen the itching and spooky feelings.
- Oily hair is thoroughly cleaned.
- Hair strands are strengthened and repaired. [24, 25]

GREEN TEA:

Biological source:

Camellia sinesis, a member of the Theaceae family, produces it from its evergreen shrub or small tree leaves and leaf buds. [26]

Fig:9

Chemical constituents:

About 90% of green tea is made up of polyphenols, 7% amino acids, proanthocyanidins, theanine, and 3% caffeine. Catechins and flavonols (myricetin, caempherol, quercetin, chlorogenic acid, coumarylquinic acid, and theogallin) are the main constituents of polyphenols. The primary catechins in green tea are epicatechin (EC), gallocatechin (GC), epicatechin gallate (EGCG), epicatechin gallate (ECG), epicatechin gallate (EGCG), epicatechin gallate (EGC), and gallocatechin gallate (GCG).

Uses:

- Green tea contains flavonoids that have been shown to speed up hair development.
- EGCG appears to increase hair growth by stimulating hair follicles and preventing damage to skin and hair cells [27, 48]

GINGER (Zingiber officinale)

Fig :10

Ginger juice for hair is quite effective in avoiding seborrhoeic dermatitis, generally known as dandruff. Dandruff is caused by a yeast infection known as malassezia, which produces irritating flakes and redness on the scalp. Antifungal medications, on the other hand, can help slow its spread. Studies have shown that ginger has a strong antifungal effect on your hair. It can assist with dandruff. Gingerol, the most common active component in ginger rhizomes, is responsible for their antibacterial capabilities. Ginger for hair also has an anti-inflammatory effect, thus it decreases inflammation and eliminates dandruff-related discomfort. [28]

Chemical constituents:

Ginger has an abundance of active substances such as phenolic and terpene components. Gingerols, shogaols, and paradols comprise the majority of Ginger includes several other phenolic compounds, including 6-dehydrogingerdione, zingerone, quercetin, and gingerenone- A. Terpenes such β-bisabolene, αcurcumene, zingiberene, α-farnesene, and βsesquiphellandrene are phenolic compounds found in ginger. 6-gingerol, 8-gingerol, and 10-gingerol are among the gingerols, the main polyphenols found in fresh ginger. [29]

Uses:

- Ginger juice prevents seborrhoeic dermatitis (dandruff), whereas antifungal medicines can reduce its development. Studies show that ginger has a strong antifungal impact on your hair. Gingerol, the main active element in the rhizome, has antibacterial effects and can help eliminate dandruff.

- Ginger for hair contains anti-inflammatory properties, which means it decreases inflammation and soothes dandruff pain. [30]

EXIPIENTS PROFILE:

ROSE WATER:

Rose water is an emollient that is also used in cosmetics such as toners, serums, and creams. Also works as a scent and moisturizer. Rose water has a moderate astringent characteristic that might help decrease oiliness and dandruff. It contains anti-inflammatory effects that might help with scalp issues. Curly-haired women vouch for the effectiveness of rose water in minimizing frizz and enhance lustre. It's also an ingredient in perfume. [31]

Fig :11

ROSEMARY OIL:

Rosemary oil is an essential oil that may be blended with any carrier oil, including olive oil, coconut oil, and jojoba oil. It offers a number of advantages, including the ability to prevent grey hair. Rosemary oil helps soothe the scalp and help with conditions like dandruff. It allows for the healthy growth of hair. [32]

Fig:12

COCONUT OIL:

Coconut oil is a great organic nutrition for hair. It promotes glossy and healthy hair development. Additionally, it works well to stop protein loss, which can lead to unattractive hair growth. Coconut oil is commonly used to cure hair on the Indian subcontinent. In such nations, the vast majority of individuals regularly apply coconut oil to their hair after taking a bath or shower... It is an excellent conditioner that helps damaged hair grow again. Furthermore, it provides the necessary proteins required for nourishing and repairing damaged hair [33]

Fig:13

STARCH:

Starch is a polymer composed of repeated units of sugar molecules. [34]

Fig:14

SODIUM BENZOATE:

Preservatives are utilized, including sodium benzoate. According to the European nomenclature E211, sodium benzoate is a benzoic acid salt that is well soluble in water, tasteless, and odorless. Because of its antifungal and antibacterial properties, it is employed as a food preservative in carefully regulated levels. It prevents the growth of mold, yeast, and bacteria. [35]

Fig: 15

MATERIALS AND METHODOLOGY:

CHEMICALS USED:

INGREDIENTS	BRAND NAME	USES
Aloe Vera	Himalaya	Hydration
Green tea	Macha green tea	Hair growth
Ginger	Awira organics	Antifungal
Rosemary oil	Ventina organics	Perfume

Test for flavonoids: **1. Shinoda test** Filtrate was treated with Mg turnings and ad Conc. HCL.	Formation of crimson red colour.  **[Fig:27]**
2.Test with an alkaline reagent: A10%solutionofsodiumhydroxideisused to trea the extract.	Intense yellow color is formed.

Rose water	Dabur Gulabari	Base
Starch	Isochem laboratory	Polymer
Sodium benzoate	Burgoyne laboratory	Preservative
Coconut oil	Local purchase	Carrier oil

Table no 1: CHEMICALS USED

IDENTIFICATION TEST:

Phytochemical screening [36]

Phytochemical Screening: chemical test for ginger:

Test for flavonoids:

Test for alkaloids:

TEST	OBSERVATION
1.Drangendroff'stest .1or2millilitresoftheDragendroffreagent are added to few milli-liters of filtrate.	Reddish brown precipitate
2.Hager'stest One or two milliliters of Hager's reagent are added to few millilitres of filtrate. .	Formation of yellow colour precipitate.

Test for glycoside:

TEST	OBSERVATION
1.Keller–killianitest (for anthraquinone glycosides) After heating the extract with glacial acetic acid, ferri chloride solution was added.	Reddish brown colour
2.Legaltest To a few mg of drug extract add few ml of Pyridine &fev drops of Nitro-preside solution	Formation pink or red colour

Test for phenolic compounds and tannins:

TEST	OBSERVATION
1. Shinoda test Filtrate was treated with Mg turnings and add conc.HCL	Formation of crimson red colour.
2.Ferric chloride test A few drops of Fecl3 solution are added to Extract that been dissolved in distilled water.	blue, green & violet colour is formed.

Test for carbohydrates:

TEST	OBSERVATION
1.Test of Molisch reagent In a test tube, add 2 milliliters of the Molisch reagent to milliliters of the drug's aqueous extract, mix gently. Th test tube's sides arethenfilledwitharound1millilitreof Concentrated sulphuric acid.	Ring that is reddish-brown where two layers meet.
2.Test of Fehling's reagent Fehling's A and B reagents are combined in equal volume a few drops of sample are Added before boiling.	Formation of Red precipitation.

Tableno:3PHYTOCHEMICALSCREENINGOFGINGER

Phytochemical Screening: chemical test for Green tea Test for flavonoids:

TEST	OBSERVATION
1.Testfor**Ferricchloride** A few drops of ferric chloride solution are added to extrac that has been dissolved in distilled water.	Blue, green & violet colour is formed.  **[Fig:28]**

2.The lead acetate test After heating 0.5 grammes of plant extract with double distilled water, 1 millilitre of a 10% lead acetate solution wa added**.**	.There was yellow precipitation.  **[Fig:29]**

Test for alkaloids:

TEST	OBSERVATION
1.Drangendroff'stest 1 or 2 milliliters of the Dragendroff reagent are added t a few milliliters of filtrate.	Reddish brown precipitate is formed.
2.TheHagertest One or two milliliters of Hager's reagent are added to few milliliters of filtrate.	Precipitate with a yellow hue forms.

Test for glycosides:

TEST	OBSERVATION
1.potassium hydroxide test A few drops of potassium hydroxide are applied t extract.	.Flavanoids glycosides are indicated by colours that ar yellow, orange, and red.

Check for tannins and phenolic chemicals:

TEST	OBSERVATION

1. Shinoda test Filtrate was treated with Mg turnings and add conc-HCL	Creation of the crimson-red.
2. Test for ferric chloride A few drops of ferric chloride solution are added to extrac that has been dissolved in distilled water.	Blue, green and violet formation  **[Fig:30]**

Table no 4: PHYTOCHEMICAL SCREENING OF GREEN TEA

Phytochemical Screening: chemical test for Aloe Vera Test for glycosides:

TEST	OBSERVATION
1.Keller–killiani test (for anthraquinone glycosides) After heating the extract with glacial acetic acid, ferri chloride solution was added.	Reddish brown Color  **[Fig:31]**
2.Legaltest .Add a few drops of nitro-prusside solution And a few milliliters of pyridine to a few milligrams of drug extract.	Creation of Pink or brown colour

Test for alkaloids

TEST	OBSERVATION
1.Drangendroff'stest OneortwomillilitresofDragendroffreagent are added to a few millilitres of filtrate.	Thereisareddish-brownprecipitate**.**
2.The Hagertest **OneortwomillilitresofHager'sreagentare added to a few millilitres of filtrate.**	***Formationofyellowprecipitate***  ***[Fig:32]***

Table no5: PHYTOCHEMICAL SCREENING OF ALOE VERA

FORMULATION OF HERBAL HAIR SERUM:

FORMULATION TABLE[37]

SL.NO	INGREDIENTS	F1	F2	F3
1	Ginger juice	3ml	5ml	6ml
2	Green tea	5ml	6ml	4ml
3	Rose water	4ml	3ml	5ml
4	Aloe Vera gel	6ml	4ml	3ml
5	Starch	_	0.5g	0.2g
6	Coconut oil	0.7ml	0.6ml	0.8ml
7	Rose-mary oil	0.8ml	0.7ml	0.9ml
8	Sodium benzoate	_	0.3g	0.5g

Table No 6: FORMULATION TABLE

PROCEDURE [38]

SOLUTION A:

The appropriate amount of green tea mixed with required amount of rose-water. Boil the solution in a water bath.

Filter the concentrated solution

To the filtrate add required amount of Aloe Vera gel. Mix it well. Then add ginger juice in accurate amount. Mix it well.

Addexcipientslikestarchaspolymerandsodiumbenzoateaspreservative. Mix the solution with mechanical stirrer.

SOLUTION B:

Oil phase can be prepared by the appropriate amount of rosemary oil as essential oil combined with coconut oil and mixed with ten minutes.

Transfer Solution A to Solution B Mix it with mechanical stirrer.

EVALUATION OF HAIR SERUM:

1. Organoleptic evaluation

The generated herbal hair serum's appearance and hue are assessed visually. [39,40]

2. pH

The pH test will be conducted using a digital pH meter. The digital pH dipper will be inserted deeply into the serum formulation sample, and the pH value will be recorded. The pH of the formulation should be acidic, as the skin has an acidic pH of around 4-6.[41]

3. Test of Homogeneity

The hair serum was applied to a dry, clean object glass, and a cover glass was sealed. The appearance was examined in the context of some uniformity and coarse particles. The homogeneity of the herbal hair serum as well as the presence of any lumps, flocculates, or aggregates were visually assessed**.** [42]

4. Viscosity

Using spindle number six, the viscosity was measured using a Brookfield viscometer (RVDV- II+PRO). The viscosity was measured at 10, 20, 50, and 100 rpm after 50 ml of hair serum was added to the beaker. [43].

5. Spread-ability Test:

The spread-ability of liquid preparations was determined using the commonly used parallel plate method. Two 20 by 20cm horizontal plates, the upper one weighing 125g, were used to crush one grams of hair serum. After one minute, the spread diameter was determined. The formulated to determine spread-ability was as follows:

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

where T is the amount of time (in seconds) needed to fully separate the slides, L is the distance travelled by the glass slide, M is the weight of the pan (attached to the top slide), and S is the spreadability.[44]

6. Washability

The formulation was applied to hair that was easily removed by washing with water and was physically verified.[45]

7. Microbial evaluation-Anti-fungal assay

PROCEDURE

Agar well diffusion method:

Potato dextrose agar was used to sub-culture *Aspergillus flavus*. The Agar well diffusion technique is used utilized to assess a plant or microbial extract's antifungal activity. A volume of the microbial inoculums is applied to the whole surface of the agar plate to inoculate it. After aseptically punching holes 6 to 8 mm in diameter with a sterile cork borer or tip, a volume of20 to 100 µL of the antifungal agent or extract solution at the designated concentration is applied to the well. Agar plates are then incubated under conditions suitable for the test micro-organism. The antifungal medication diffuses throughout the agar medium, inhibiting the development of the tested fungus strain.

The *Aspergillus flavus* is grown in the potato dextrose agar.

- Temperature of incubation: *A. flavus* grows best at 37°C (99°F), with a minimum growth temperatureof12°C(54°F) and a maximumgrowthtemperatureof48°C(118°F).At 30- 55°C (86-131°F), *A. flavus* grew quickly; at 12-15°C (54-59°F), it grew slowly; and at 5- 8°C (41-46°F), it grew nearly no more.
- Incubationtime:24hrs.

RESULT AND DISCUSSION:

PYTOCHEMICAL SCREENING

The phytochemical screening of aqueous extracts was carried out and the result are tabulated as below.

CONSTITUENTS	GINGER	GREENTEA	ALOEVERA
Alkaloids	-	+	+
Glycosides	-	-	+
Carbohydrates	+	+	+
Flavonoids	+	+	+
Phenolic compounds and tannins	+	+	+

Tableno7: RESULT OF PHYTOCHEMICAL SCREENING

EVALUATION OF HERBAL HAIR SERUM:

ORGANOLEPTIC EVALUATION OF HERBAL HAIR SERUM

Theorganolepticevaluationofformulatedherbalserumwascarriedoutandtheresultaretabulated below:[46]

ORGANOLEPTIC EVALUATION	FORMULATIONS		
	F1	F2	F3
Color	Yellowish orange	Yellowish orange	Yellow
Odour	Characteristics Odour	Characteristics Odour	Characteristics Odour

Texture	Silky water	Smooth homogeneous	Smooth homogeneous
Homogeneity	Moderate	Good	Good

Tableno8: RESULT OFORGANOLEPTIC EVALUATION OF HAIR SERUM

1. DETERMINATION OF PH

The pH of formulations F3 was found to be 5.08. As the scalp having an acidic pH around 4.5-5.5, this range of formulation is suitable for hair. The results are mentioned below in the table no

Fig:33

2. DETERMINATIONOFVISCOSITY

Viscosity is a critical parameter for topical formulations. Topical solution with low viscosity has faster clearance than viscous solution. Viscosity of hair serum was to be 17473 pa s.

Fig:34

3. SPREADABILITY

Spread-ability of formulationF3was foundtobe7.58.

4. WASHABILITY

Serum was completely removed from hair.

5. MICROBIALSTUDY

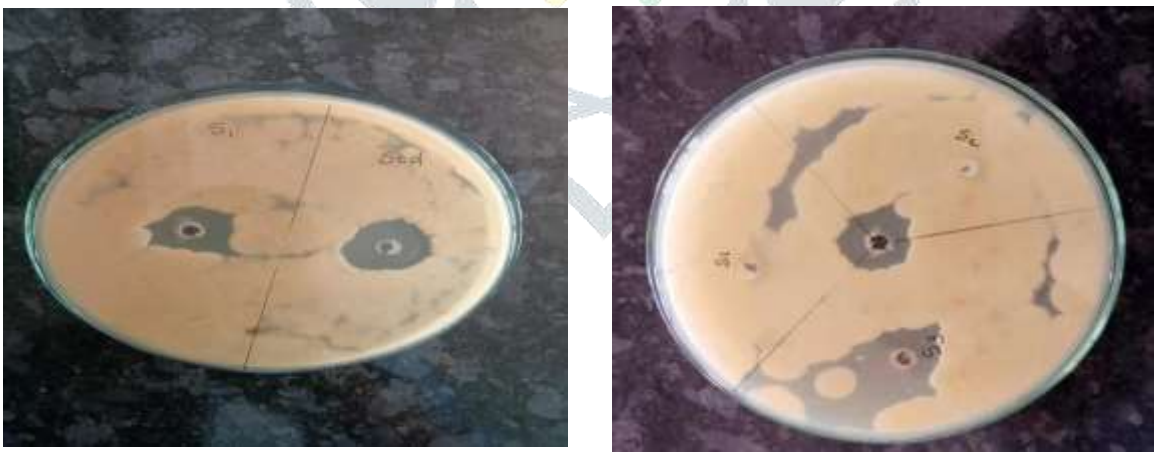
SL.NO	DRUG	CONCENTRATION (%)	ZONEOFINHIBITION (inmm) OF Aspergillus flavus
1.	Standard drug (clotrimazole)	1%	24mm
2.	Sample drug	Ginger extract–9%	20mm

Table no9: RESULT OF MICROBIAL STUDY

Using the agar well diffusion technique in a Muller Hinton agar plate, the antifungal hair serum formulation was evaluated against *Aspergillus flavus*. Then the zone of inhibition was observed and compared with the standard formulation

The result for the formulated anti-fungal hair serum against *Aspergillus flavus* strains were determined using antifungal sensitivity test. The zone of inhibition of sample drug was found to

be 20mm .1% clotrimazole retained a greater zone of inhibition (24mm) when compared to the formulated hair serum.



(1) **(2)**

Fig:35

SL. No	EVALUATION PARAMETER	F1	F2	F3
1.	DETERMINATION OF PH	4.87	6.23	5.08
2.	VISCOSITY	32721pas	1444pas	17473pas
3.	SPREADABILITY	6.46	5.25	7.58
4.	WASHABILITY	Good	Poor	Good
5.	MICROBIALSTUDY	No zone of inhibition	No zones of inhibition	20mm

Tableno10: EVALUATION PARAMETERS AND VALUES

DISCUSSION:

We prepared 3 formulation of antifungal herbal hair serum. In the first formulation the concentration of ginger juice used with basic serum formulation, from which we obtained a liquid consistency, and the formulation has lesser stability. Due to the lesser concentration of ginger juice, the formulation has lesser anti-fungal property. In the second formulation, we use sodium benzoate as an extra preservative than rosemary oil. So, the stability of formulation was increased. The presence of starch as a polymer which will enhance the thickness than the first formulation. In the third formulation we took much more concentration of ginger juice, and sodium benzoate as active ingredient and preservative respectively. Therefore, the antifungal activity of the serum has been improved than the previous two formulations. The presence of sodium benzoate which will boost the stability of the last preparation than others. The pungent Odour of the serum has been minimized by adding more concentration of rose water as a base. After the formulation procedure we conclude that third formulation has been selected with excellent antifungal property.

CONCLUSION

Physical appearance, pH, anti-fungal assay, viscosity, and spread-ability were all considered in the formulation and evaluation of the anti-fungal herbal serum. We have formulated 3 formulations with varying concentration of Ginger juice, Green Tea, Aloe Vera, Rosemary oil, Coconut oil, Rose water, Starch, Sodium benzoate out of which the 3rd formulation is the most stable one. In a potato dextrose agar plate, the third formulation—which was the most stable—was tested against Aspergillus flavus using the agar well diffusion method. Then zone of inhibition was observed and compared with the std formulation. The zone of inhibition of sample drug(20mm) which is lower than the standard formulation (24mm). This study reveals that the formulated (F3) antifungal serum has excellent antifungal activity due to the presence of ginger juice.

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