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Formulation and Evaluation of Hair Serum Using Clitoria Ternatea and Cyanthillium Cinereum for Dandruff

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ABSTRACT: This Study combines extracts of Clitoria ternatea (butterfly pea flower) and Cyanthillium cinereum (small ironweed) to formulate and test a hair serum intended to treat dandruff. The necessity for a safe, natural substitute for artificial dandruff treatments was the issue that was addressed. Both plants were picked because of their abundance of phytochemicals, which include phenolic acids, flavonoids, alkaloids, and anthocyanins. These compounds have antifungal, antioxidant, and scalp-nourishing qualities. Aqueous maceration was used to prepare the extracts, which were then combined with excipients such glycerine, xanthan gum, lavender oil, tween 80, phenoxy ethanol, and rose water to create a serum formulation. Physical appearance, homogeneity, pH, viscosity, Spreadability, antifungal activity, and stability were all assessed for the serum. The agar well diffusion method was used to investigate the antifungal efficacy against Candida albicans, with a 13 mm zone of inhibition. According to the results, the serum works well to prevent dandruff, support healthy scalps, and lower the possibility of adverse consequences linked to chemical formulations. The recipe offers a non-greasy, lightweight solution that is appropriate for daily usage. To ensure its safety and effectiveness for wider use, preclinical and clinical research are advised.

KEY WORDS: Antifungal, herbal formulation, stability, natural extracts, phytochemicals, dandruff, hair serum, Clitoria ternatea, and Cyanthillium cinereum.

I. INTRODUCTION

COSMETICS

The winds of social change are blowing hard in the twenty-first century anywhere that cosmetics are used. The word "cosmetic" comes from the Greek word "Kosmeticos," which means "adorn" and "preparation." Cosmetics are used for this purpose. A cosmetic is a product that is used to the human body for the purposes of washing, beautifying, boosting attractiveness, or changing the look without harming the structure or functions of the body, according to the FDA. "Cosmetics are external preparations intended to be applied to external parts of the body, such as the skin, hair, and nails, for colouring, covering, softening, cleaning, nourishing, waving, setting, mollification, preservation, removal, and protection," is one definition of cosmetics**.** All cosmetic procedures can be used for brief or extended periods of time to enhance physical appearance, maintain some degree of physical health, and affect other people's psychological well-being. In order to affect the colour or lustre of areas, the cosmetic product either adheres merely superficially or penetrates under the outermost layer to deliver active chemicals into deep-lying layers. Cosmetics used for aesthetic objectives, such as mascara, rouge, eye lines, and facial masking preparations, have the potential to cause undesirable side effects. Cosmetics are made up of blends of chemicals that can be produced synthetically or from natural sources [9].

HAIR SERUM

Hair serum is a liquid-based treatment that is typically made with silicones to help smooth frizz and provide a protective layer over the hair fiber. Because of the way this silky layer reflects light, serum provides hair a glossy, non-greasy look. It can be used to style and cure a variety of hair issues, including manageability, dullness, and dryness. A liquid solution with a somewhat thicker viscosity than water is called a hair serum. It is used to treat a variety of hair-related issues, including split ends, dandruff, dry hair, frizzy hair, and hair loss. Serum gives the scalp and hair roots intense nourishment. Hair style is not the only use for hair serum. They are also used to address a variety of hair issues, such as unruly, dull, and dry

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hair.This style product, which has a silicone basis, is intended to be applied to the hair's surface to help provide shine, smoothness, hydration, humidity, and pollution protection. Typically, hair serums are enhanced with phytoextracts, biotin, essential oils, and other substances. Along with other nourishing hair oils or moisturizing agents, it adds moisture to the hair strands. Additionally, it keeps the hair hydrated by retaining moisture while shielding it from contaminants, styling tools, and UV rays[12].

DANDRUFF

The prevalence of dandruff as a common scalp condition, characterized by itching, redness, and flaking, has driven demand for safer, natural alternatives to synthetic treatments. The extracts of Clitoria ternatea and Cyanthillium cinereum, two medicinal plants recognized for their antifungal, antioxidant, and anti-inflammatory properties, to develop a hair serum. While synthetic treatments exist, they often pose side effects, driving interest in natural, herbal solutions. The antifungal and antioxidant properties of Clitoria ternatea and Cyanthillium cinereum to develop a hair serum aimed at combating dandruff while promoting scalp health.The increasing demand for natural and safe alternatives to chemical-based dandruff treatments highlights the importance of herbal formulations. Clitoria ternatea and Cyanthillium cinereum are selected for their traditional use in treating scalp issues. Both plants possess antifungal, antioxidant, and anti-inflammatory properties, making them ideal for scalp health. This study focuses on developing a hair serum with these extracts and evaluating its effectiveness against Candida albicans[1].

II. MATERIALS AND METHODS

PLANT PROFILE

- **Clitoria ternatea**

Fig 1

Clitoria ternatea or butterfly pea, is a perennial herbaceous plant that belongs to the Fabaceae family. This plant has a robust woody rootstock and can climb, scramble, or trail. This plant is specifically cultivated as a revegetation and creeper. Tannins, phlobatannin, proteins, alkaloids, triterpenoids, phenols, carbohydrates, saponins, triterpenoids, flavanoids, flavanol glycosides, anthraquinone, anthocyanins, cardiac glycosides, Stigmast-4-ene-3,6-dione, volatile oils, and steroids were all found aschemical constituents. It has been demonstrated that Clitoria ternatea's leaves, seeds, and flowers exhibit antifungal action against a variety of fungus, such as Candida albicans and Aspergillus niger. Finotin and cystein-rich protein are thought to be responsible for Clitoria ternatea's antifungal qualities. Clitoria ternatea also possesses antibacterial, antipyretic, and anti-inflammatory qualities[6].

BENEFITS[1]

- ✓ **Enhances hair health**: Clitoria ternatea slows down the onset of grey hair, increases hair growth, decreases hair loss, and feeds hair follicles. Anthocyanins, a substance found in it, is known to improve blood flow to the head and preserve a healthy scalp.
- ✓ **Antifungal activity:**Clitoria ternatea leaf, seed, and callus extracts have demonstrated antifungal activity against Aspergillus niger and Alternaria solani, among other fungal strains. Additionally, the floral extracts have demonstrated antifungal properties. Candida albicans-induced dandruff may be lessened by the antifungal qualities of Clitoria ternatea secondary metabolites.
- ✓ **Effects of antioxidants:** Antioxidants combat free radicals. Thus, these can shield your hair and skin from harm.

- **Cyanthillium cinereum**

Fig 2

The perennial herbaceous plant Cyanthillium cinereum, also called little ironweed, is primarily found in tropical regions such as India and Southeast Asia. The stem of the plant is thin, ribbed, grooved, and has a few branches. Its roots have a short fracture and a dirty brown exterior. The smooth, dark green leaves might be widely

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elliptic or lanceolate in form. The blooms have five petals, bisexual organs, and are spherical or flat-topped corymbs that are white and purple or pink.Alkaloids, flavonoids, glycosides, proteins, carbohydrates, and essential oils are all present in the plant. Antifungal, antibacterial, antioxidant, anti-inflammatory, and analgesic qualities are all part of Cyanthillium cinereum's biological activity. Its numerous components make it a viable option for the treatment of bacterial and fungal illnesses[8].

BENEFITS

- ✓ **Encourages hair development:** By stimulating hair follicles, the nutrients and chemicals found in plants can promote hair growth and lessen hair loss. It can fortify hair roots and stop hair breakage. Its antibacterial and anti-inflammatory qualities can help maintain the scalp healthy and clean by treating dandruff and other scalp infections.
- ✓ **Reduces itching and irritation of the scalp:** Anti-inflammatory properties can reduce itching and irritation of the scalp, thereby alleviating dermatitis, psoriasis, and eczema.
- ✓ **Antifungal qualities:** The plant has antifungal qualities that can help treat fungal infections and stop the growth of fungus. Treatment of fungal infections, inhibition of fungal growth, and antibacterial activity are among the advantages of antifungals. For fungal infections, it has long been utilized as a natural treatment[10].

PREPARATION OF Clitoria ternatea FLOWER EXTRACT

After being gathered and shade-dried for a few months, the fresh Clitoria ternatea flowers were ground into a fine powder and combined with distilled water in a particular substrate solvent ratio [1:20 (w/v)] using a professional blender set to low speed for 40 seconds. For a predetermined amount of time (60 minutes), the blended mixture was kept in a thermostatic water bath that was set to a particular temperature (60°C). Whatman filter paper was then used to filter the mixture. The filtrate was gathered and kept at a cold temperature[3].

PREPARATION OF Cyanthillium cinereum PLANT EXTRACT

The entire Cyanthillium cinereum plant was gathered, shade-dried for a few months, and then ground into a fine powder. The maceration procedure was used to extract it. The extraction solvent was water.In a 100 mL beaker, 5 g of Cyanthillium cinereum powder was mixed with 50 mL of water. It was macerated for 35 minutes at 100°C in a hot air oven. After three extractions, the mixture was passed through Whatman filter paper. The filtrate was gathered and kept at a cold temperature[4].

FORMULATION TABLE

SI NO.	INGREDIENTS	OFFICIAL FORMULA
1	Clitoria ternatea flower extract	10ml
2	Cyanthillium cinereum plant extract	10ml
3	Glycerin	1.5ml
4	Xanthan Gum	0.1g
5	Lavender oil	0.3ml
6	Tween-80	0.3ml
7	Phenoxy ethanol	0.3ml
8	Rose Water	7.5ml

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Fig 3

PROCEDURE

1. Preparation of Aqueous Phase:

- In a clean beaker, add the required amount of rose water (about 70% of the total volume) and glycerine.
- Sprinkle Xanthum gum slowly while stirring continuously to avoid clumping.
- Continue stirring about 10-15 minute until the gum is fully hydrated and forms a slightly thick solution.

2. Addition of Active Extracts:

- Once the aqueous phase is ready, add the Clitoria ternatea extract and Cyanthillium cinereum extract into the mixture.
- Stir well to ensure uniform distribution of the extracts.

3. Preparation of Oil Phase:

- In a separate container, mix lavender oil with Tween 80. Stir until combined and clear to get oil phase.
- Stir well until the emulsifier is fully incorporated into the oil.

4. Emulsification:

- Slowly add the oil phase into the aqueous phase drop by drop while stirring continuously.
- Continue stirring until a uniform, smooth emulsion is formed.

5. Addition of Preservative:

- Add phenoxy ethanol as a preservative and mix thoroughly.

6.Final Mixing:

- Continue mixing the serum for a few more minutes to ensure all ingredients are well combined and the serum has a smooth, uniform texture.

III. EVALUATION STUDIES

1. **Visual inspection for appearance:** The prepared hair serum was inspected visually to evaluate its texture, color, and appearance[11].
2. **Homogeneity Test:** The serum was applied to a dry, clean glass object, and the cover glass was then sealed over it. To look for any coarse particles or indications of non-uniformity, the sample was examined under light. The purpose of this test was to find lumps and flocculates in hair serum[11].
3. **pH Test:** A pH paper will be used to determine the pH test. Take note of the pH value that is displayed on the paper[11].
4. **Viscosity measurement**: An Ostwald viscometer was used to measure viscosity. The serum is poured into the capillary tube. The thickness and flow characteristics of the serum were determined by this technique [11].
5. **Spreadability Test:** This test was conducted using a parallel plate method, which is commonly used to evaluate and quantify the likelihood of semi-solid preparations.Between two horizontal plates, the upper of which weighed 100 grams, 1 gram of hair serum was pushed. After a minute, the spread's diameter was measured [11].
6. **Antifungal study**

- Sabouraud's Dextrose Agar (SDA), 15 lbs., autoclaved at 121° C for 15 minutes.
- Pour into a 90mm sterile petri plate after cooling to 45°C to 50°C.
- Using a sterile swab, swab the chosen organism onto an SDA plate. Then, using a sterile cork borer, cut a well and add the sample.
- After 48 hours of incubation at room temperature, the diameter of the inhibitory zones was determined [7].

7. **Stability Test:** The hair serum was stored at room temperature for a month. in contrast to the initial viscosity and pH. After a month, the

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hair serum's pH and viscosity were assessed [11].

IV. RESULT AND DISCUSSION

1. Preparation of extract

Clitoria ternatea Flower extract

Cyanthillium cinereum Plant extract

2. Chemical Test

- **Clitoria ternatea Flower extract**

EXPERIMENT	INFERENCE
Test for anthocyanins (Sulphuric acid Test) Mix 2 ml of plant extract with 2 ml of $2NH_2SO4$, then add a few ml of ammonia.	positive
Test for Flavonoids (Shinoda Test) Dissolve the extract solution in 95% ethanol, then add a small piece of magnesium foil and 3-5 drops of conc HCl.	positive
Test for Alkaloids (Dragendorff's Test) 1ml of Dragendorff's reagent were added to 2ml of extract	Positive
Test for Phenolic acid ($Fecl_3$Test) Add 1-2 drops of Ferric chloride solution to the extract	positive
Teat for Saponins (Foam Test) To the plant extract add few drops of distilled water and shaken well.	positive

Tab 1

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➢ **Cyanthillium cinereum Plant extract**

EXPERIMENT	INFERENCE
Test for terpenoids (Salkwoski Test) Mix 5ml plant extract with 2ml of chloroform and 3 ml sulfuric acid.	positive
Test for flavonoids (Alkaline reagent test) Add few drops of NaOH to 2ml of extract	positive
Test for carbohydrates (Molisch's Test) To the sample solution add few drops of Molisch's reagent, then add a few drops of concentrated Sulphuric acid along the side of the test tube.	positive
Test for Phenolic acid (Litmus paper test) A piece of litmus paper is dipped into plant extract.	positive
Dragendorff's Test 1ml of Dragendorff's reagent were added to 2ml plant extract	positive

Tab 2

3. Physical Characteristics

PARAMETER	RESULT
Color	Light Lavender
Odor	Pleasant
State	Slightly Viscous

Tab 3

4. Homogeneity Test:

EXPERIMENT	RESULT
Clarity Test	Absence of white spots and Black spots

Tab 4

5. Determination of pH:

EXPERIMENT	RESULT
Digital pH meter	4.4

Tab 5

6. Viscosity Measurement:
Using an Ostwald viscometer, the viscosity of the hair serum was measured and found to be 1250 cps, which is around the expected value.

7. Spreadability Test
The formulation shows optimum Spreadability.

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8. Antifungal study

The agar well diffusion method was used to investigate the antifungal activity against Candida albicans. The microorganism's susceptibility to the chemical under test is shown by the size of the inhibitory zone. With a 13 mm zone of inhibition, hair serum containing Clitoria ternatea and Cyanthillium cinereum has antifungal efficacy against the Candida albicans fungus species.The results show that even at high concentrations, the formulation can be utilized to stop dandruff brought on by Candida fungi.

ORGANISM	ZONE OF MEASUREMENT (mm)
Candida Species	13

Tab 6

9. Stability Study

PARAMETERS	BEFORE 1 MONTH	AFTER 1 MONTH
Colour	Light lavender	Light lavender
Odor	Pleasant	Pleasant
pH	4,4	4,4
Texture	Smooth	Smooth
Consistency	Slightly viscous	Slightly viscous

Tab 7

V. CONCLUSION

This study successfully formulated and evaluated a natural hair serum using Clitoria ternatea and Cyanthillium cinereum. The serum exhibited effective antifungal activity and satisfactory physical and chemical properties, making it a promising alternative to synthetic products. Future work will focus on clinical trials, product optimization, and market comparisons to enhance its therapeutic potential and consumer appeal.

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