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FORMULATION AND EVALUATION OF POLYHERBAL FACE SERUM FOR TREATMENT OF HYPERPIGMENTATION

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ABSTRACT

Face serum is a light formulation that contains many active ingredients that target specific skin concerns and offer many benefits. Natural ingredients, like herbs, are becoming really popular in cosmetics worldwide. These products use herbs to help with things like making your skin smoother and keeping it healthy. The purpose of this research was to prepare and evaluate an herbal face serum for **Hyperpigmentation** containing ***Clitoriaternetea*** (Butterfly pea) and ***Tageteserecta*** (Marigold) as key ingredient. The herbal facial serum was evaluated for various parameters such as pH, spreadability, irritability test and homogeneity. The results showed that all the formulations produced satisfactory results and the use of herbs in the serum will produce a successful alternative to other harmful chemical cosmetics. These herbal extracts are included for their anti-aging, antibacterial, antioxidant, Hyperpigmentationand anti- inflammatory properties, aiming to enhance the effectiveness of the serum.

KEYWORD: Herbal, phytochemical, Face serum, antiaging, antioxidant, anti-Inflammatory.

INTRODUCTION

Medicinal plants have been integral to traditional healthcare systems for millennia, serving as reservoirs of bioactive compounds with therapeutic potential. The rising interest in plant-based remedies is driven by their relative safety, cost-effectiveness, and broad bioactivity. Among promising candidates is **Clitoriaternatea** (Fabaceae), commonly known as butterfly pea — a herb long used in Ayurveda and folk medicine for memory enhancement, anti-inflammatory, antioxidant, and neuroprotective effects. A comprehensive review has detailed its phytochemical constituents (anthocyanins, flavonoids, triterpenoids, saponins, alkaloids), along with its broad spectrum of pharmacological properties including anti-diabetic, anti-cancer, antimicrobial, and hepatoprotective actions ([A Comprehensive

Evaluation of Clitoriaternatea] Another plant of interest is **Tageteserecta** (marigold), known not only for its ornamental value but also for medicinal potential. Its petals and leaves are rich in carotenoids, flavonoids, and essential oils; recent investigations highlight its antioxidant, antimicrobial, and therapeutic effects against tumor cell. In pharmacognostic and quality control studies, physicochemical and botanical characterization of *T. erecta* flower have been carried out to standardize herbal formulations.[1]

CLITORIA TERNATEA

The butterfly pea, also known as Clitoriaternatea L., belongs to the Fabaceae family. It is widely grown in Southeast Asia and other tropical regions. The Ayurvedic medical system is the oldest and most well-known medicinal system in India, having been in use for centuries. In this approach, medicinal herbs are used to cure a range of ailments and may even serve as a source of pharmaceuticals. Medhya drugs are a type of herbal medicine used in the Ayurvedic medical system to increase cognitive abilities. These herbal remedies include extracts of Clitoriaternatea (CT), Celastruspaniculatus, Acoruscalamus, Centellaasiatica, and Areca catechu. Clitoriaternatea is a well-known Ayurvedic plant and herbal treatment used to treat a number of diseases. The butterfly pea bloom has a blue tint. This suggests anthocyanins are present. According to the example, it is used to provide color to food and other products. One of the plants is the butterfly pea (Clitoriaternatea L.). Whereas each component benefits our bodies in some way. The flowers contain polyacylatedanthocyanins, while ternatins are flavonol glycosides. These include agents that treat diabetes, lower obesity, and antioxidants. Anti-inflammatory, anti-cancer, anti-hyperlipidemic, and asthmatic medications. It is good for one's health. This is compatible with the fact that anthocyanins' chemical nature renders them very soluble in water. Clitoriaternatea flowers contain a variety of phytochemical compounds, including flavonoids, with anthocyanins accounting for the vast majority of the color components. The flowers of the butterfly pea plant contain anthocyanins. They work as organic antioxidants, preventing premature ageing. helps to prevent the skin from aging. The blue color of Clitoriaternatea flowers is commonly used as a natural coloring agent in a range of dinnerware. Flowers have anti-inflammatory, anti-cancer, anti-diabetic, and antioxidant effects.[5]

TAGATES ERECTA

Edible flowers have received more attention during recent years, motivated not only by their culinary properties which add a unique texture, color, and taste to modern recipes such as soups, salads, and desserts, but also for their high amount of polyphenols which could conditionate their uses in therapy. Thus, consumers seek edible flowers, and their commercialization has increased exponentially. In fact, these new foods have become a “fashion ingredient” in some countries such as the United Kingdom and Australia. However, consumers perceive the information on edible flowers to be limited. In this line, Guiné et al. described the perception of this edible flower in a European country (Portugal) and a Latin American country (Costa Rica), and more than 90% of participants stressed that the availability of information about this type of food is insufficient. Thus, it is necessary to contribute tounraveling the effects of edible flowers on human metabolism, in order to synthesize functional food products based on these ingredients.[4]

Tageteserecta, commonly known as the Mexican marigold, is a Mexican plant that is deeply rooted in the popular culture of this North American country. This flower plays a key role in the country’s most iconic celebration, the “Day of the Dead”. In this commemoration, Mexican marigold petals decorate paths and shrines in Mexican homes. Some authors have studied the possible biological activities of extracts obtained from the petals of Mexican marigolds. They reported effects against Alzheimer’s disease-related amyloidosis in worms and described its gastric healing activity in a

murine model. These activities could be associated with various chemical components including carotenoids and polyphenols. Some authors have identified lutein (a carotenoid) and laricitrin (a flavonoid) as the main chemical structures abundant in *T. erecta* and responsible for its biological activities.[1,2]

The incidence of aging-associated diseases like cancer and AD has increased exponentially in recent years, especially in Western countries. Several authors have proposed that according to the oxidative theory of aging, some of the age-related damage could be mediated by the accumulation of ROS.[13]The relationship between cancer and ROS is complex and depends on the context. However, some authors have proposed that reducing ROS levels could decrease tumor progression and metastatic activity in different types of cancer. The connection between ROS accumulation and tumorigenesis could be explained in two ways: on one hand, the increment of ROS could directly oxidate cellular macromolecules like proteins, nucleic acids, and/or lipids and promote gene mutation and consequently induce the inflammation process. However, other authors propose that ROS accumulation could activate aberrant signaling cellular pathways associated with tumorigenesis. Furthermore, oxidative stress may be implicated in different neurodegenerative disorders like AD or Parkinson's disease. Hence, high ROS levels could be found even in the early stages of these diseases. An unbalanced ratio between antioxidants and pro-oxidants could activate lipid peroxidation and protein damage, altering the metabolism of hippocampal and parietal cortex pyramidal neurons.[6,11]

MATERIALS AND METHODS

Plant Material Collection and Authentication

The plant parts (flowers / leaves) of Clitoriaternatea and Tageteserecta are collected from defined locations, during their flowering season. Botanical authentication should be performed by a taxonomist, and voucher specimens deposited in a herbarium for future reference.

Preparation of Extracts

Dried and pulverized plant material is subjected to extraction using solvents of increasing polarity (e.g., hexane, chloroform, ethyl acetate, methanol, water) or by methods like maceration, Soxhlet, or ultrasonic-assisted extraction. For example, extraction protocols for Clitoriaternatea flower using maceration or ultrasound-assisted extraction have been shown to improve yield of anthocyanins and flavonoids.[12]

Plant profile

Figure 1: Clitoria Ternatea.

Taxonomical classification

Biological source	Clitoriaternatea L.
Synonyms	Asian pigeonwings, bluebellvine, blue pea, butterfly pea, cordofan pea, Darwin pea, aparajita (Ayurveda)
Family/Class	Fabaceae / Magnoliopsida
Species	C. ternatea
Parts used	Flowers, leaves, roots

Description: A perennial, herbaceous vine with vivid blue flowers, native to tropical asia, commonly used in traditional medicine, foof, and cosmetics.[12]

Figure 2: Tagates Erecta.

Taxonomical classification

Biological source	Tageteserecta L.
Synonyms	African marigold, Aztec marigold, cempasúchil, Mexican marigold, marigold orange, marigold yellow
Family/Class	Asteraceae / Magnoliopsida
Species	T. erecta
Parts used	Flowers, sometimes leaves

Description: An annual herb with bright orange/yellow flowers, widely distributed from Mexico to India, highly valued in Ayurveda, Siddha, and folk medicine.

AIM AND OBJECTIVE

1. Present an updated introduction and rationale for studying these plants.
2. Outline standardized materials and methods used in extraction, evaluation, and pharmacognostic testing.
3. Summarize pharmacognostic and evaluation studies, comparing findings and gaps.
4. Provide suggestions for future work and standardization in herbal research.[10]

Formulation of Polyherbal Face Serum

Aqueous Extract Production (Decoction Method)

This is the initial phase where the active water-based ingredient for the serum is created.

Requirements

- 50g of Clitoriaternatea flowers
- 50g of Tageteserecta flowers
- 500ml round-bottom flask
- Distilled or deionized water (solvent)

- Heating wave machine
- Clevenger apparatus
- Beakers or collection flasks
- Filter paper or fine-mesh sieve

Procedure

Step 1: Preparation of essential oil for Clitoriaternatea & Tageteserecta

1. Thoroughly clean and sterilize all glassware and equipment (round-bottom flask, Clevenger apparatus, etc.) to prevent contamination.
2. Wash the Clitoriaternatea and Tageteserecta flowers.
3. Gently crush or chop the plant material to increase its surface area, which improves extraction efficiency.
4. Place the prepared plant material (total 100g) into the 500ml round-bottom flask. Due to the flask size, this may need to be done in two batches.
5. For a 50g batch of plant material, add 500ml of distilled water as the solvent.
6. Securely connect the round-bottom flask to the Clevenger apparatus.
7. Attach the condenser to the Clevenger and connect it to a cold water source.

Step 2: Heating and Extraction

1. Place the flask on the heating wave machine and bring the water to a gentle boil.
2. The boiling water will generate steam, which will pass through the plant material, carrying the water-soluble compounds with it.
3. This steam will then enter the condenser, cool, and condense back into a liquid (the decoction), which will collect in the Clevenger's receiving arm.

Step 3: Collection and Filtration

1. Once a sufficient volume of liquid has been collected (e.g., around 200-250ml per batch), turn off the heat.
2. Carefully collect the liquid from the Clevenger apparatus.
3. Allow the extract to cool completely to room temperature.
4. Pass the liquid through a fine filter (e.g., filter paper) to remove any remaining plant particles, resulting in a clear Aqueous Phase for your serum.[5,7]

Preparation of Emulsion Serum Formulation

This phase involves combining the aqueous extract with other ingredients to create a stable, finished product.

Requirements

- The aqueous decoction prepared in Part 1.
- Oil Phase Ingredients:
  - A skin-friendly carrier oil (e.g., jojoba oil, argan oil).
  - A natural emulsifier (e.g., Olivem 1000, Montanov 68).
- Preservative:A broad-spectrum, natural-compliant preservative (e.g., Geogard ECT).
- pH Adjuster:A weak solution of citric acid or lactic acid.
- Equipment:

1. Digital scale (with 0.01g precision).
2. Two heat-safe beakers.
3. Hot plate
4. Thermometer.
5. Whisk or magnetic stirrer.
6. pH meter or pH strips.
7. Sterilized dropper bottles.

Formulate Your Recipe

1. Decide on the total final volume of your serum (e.g., 100g).
2. Calculate the weight of each ingredient based on percentages (e.g., 75% aqueous phase, 20% oil phase ingredients, 5% preservative/actives).
3. Always follow the manufacturer's recommended usage rate for each ingredient.

Prepare the Phases

4. Water Phase: Weigh the required amount of your cooled, filtered decoction into one heat-safe beaker.
5. Oil Phase: In a second heat-safe beaker, weigh your carrier oil and your emulsifier.

Heat and Combine

6. Place both beakers on the hot plate and heat them simultaneously.
7. Use the thermometer to monitor the temperature. Heat both phases to the emulsifier's required temperature (typically 70-75°C).
8. Ensure both are at the same temperature before combining.
9. Slowly pour the entire oil phase into the water phase while continuously whisking or mixing vigorously. The mixture will begin to thicken and become an opaque, creamy liquid.

Cool Down and Add Preservative

10. Remove the beaker from the heat and continue to mix as the emulsion cools.
11. Once the temperature drops below 40°C, add your preservative and any other heat-sensitive ingredients.
12. Mix thoroughly to ensure even distribution.

Test and Adjust pH

13. When the serum has cooled to room temperature, use a pH meter or pH strips to check the pH.
14. The target pH for a face serum is typically between 4.5 and 5.5.[9]
15. Adjust with a few drops of your pH adjuster solution if necessary, then re-test.

Packaging

16. Transfer the finished serum into a clean, sterilized dropper bottle.
17. Label the bottle clearly with the product name and date.

Store the serum in a cool, dark place away from direct sunlight.[2]

Evaluation of Emulsion Serum

1. Organoleptic Evaluation

The resulting cream was assessed for its organoleptic characteristics, including color, odor, and texture. The appearance of the cream was evaluated based on its color and smoothness.

2. Wash ability

The cream was applied to the hand and observed under running water.

3. pH of the Cream

The pH meter was calibrated using a standard buffer solution. 0.5grams of the cream were weighed and dissolved in 50 ml of distilled water, and the Ph was measured using a digital pH meter.[8]

4. Irritancy Test

A 1 sq. cm area was marked on the dorsal surface of the left hand. The cream was applied to this area, and the time was noted. The area was monitored for any signs of irritancy, erythema, or edema at regular intervals for up to 24 hours and documented.

5. Spreadability Test

The spreadability of the formulated cream was measured by placing a sample between two slides, then compressing it to a uniform thickness with a definite weight for a set time. The time required to separate the two slides was recorded as the measure of spreadability. The shorter the separation time, the better the spreadability.

Spreadability was calculated using the following formula.

Spreadability = m.l/t

Where,

m is the weight attached to the upper slide

l is the length of the glass slide

6. Phase Separation

The prepared cream was transferred to a suitable wide-mouth container and set aside for storage. The separation of the oil and aqueous phases was observed after 24 hours.[2,3]

Report

The study is aimed to Clitoriaternatea and Tageteserecta extracts, standardized and incorporated in an emulsion-based face serum, for safe and effective anti-acne and skin-conditioning applications.

The Formulation is made into face serum USP and it is characterized by physical parameters such as Physical appearance, PH. Organoleptic, Washability, Spreadability Test, Irritancy Test, Phase Separation is as per standard guidelines given in IP.

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