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Formulation and Evaluation of Polyherbal Face Serum Using *Daucus carota* Extract

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ABSTRACT:

The study focuses on the development and evaluation of a polyherbal face serum using naturally derived herbal extracts known for their skin benefits. The formulation incorporates ingredients such as Aloe vera, Carrot,Curry leaves, chosen for their moisturizing, antioxidant, and soothing properties. The serum was prepared using a suitable base to ensure light texture, easy absorption, and stability. The product was evaluated for physicochemical properties including pH, viscosity, spreadability, homogeneity, and stability. Additionally, a skin irritation test was conducted to ensure safety. The formulation exhibited a stable texture, suitable pH for facial application, good spreadability, and no signs of irritation. Antioxidant activity tests indicated that the serum effectively neutralizes free radicals, supporting its protective role against skin damage. The results suggest that the polyherbal face serum is a safe, effective, and natural alternative for daily skincare, highlighting the potential of herbal ingredients in cosmetic formulation.

Keywords: Face Serum, *Daucus carota,* Polyherbal, Well-nourished skin.

INTRODUCTION:

HERBS:

Herbs refers to any substance, formulation, or product that is derived entirely or primarily from plants and their parts, such as leaves, flowers, seeds, bark, stems, roots, or fruits, which are believed to possess medicinal, therapeutic, or health-enhancing properties. Herbal products are widely used in traditional systems of medicine, such as Ayurveda, Traditional Chinese Medicine, and Unani, and are gaining popularity in modern healthcare, cosmetics, and nutrition. These natural preparations may be used for the prevention and management of various health conditions, improvement of overall well-being, or enhancement of skin and hair care. Unlike synthetic drugs, herbal products typically contain a complex mixture of active phytochemicals, which may work synergistically to produce beneficial effects. The use of herbs is based on centuries of empirical knowledge, and modern science continues to explore and validate their pharmacological and therapeutic potential[1-4].

POLYHERBAL PRODUCTS:

Polyherbal products are therapeutic or cosmetic formulations that contain a blend of two or more medicinal herbs, carefully selected and combined based on their individual and synergistic properties. Unlike single-herb preparations, polyherbal formulations are designed to enhance the efficacy, balance the action, and minimize the possible side effects of the individual plant components. The concept of using multiple herbs in a single preparation is rooted in traditional systems of medicine such as Ayurveda, Siddha, and Unani, where the combination of herbs is believed to work in harmony to provide holistic healing. Each herb in the formulation contributes specific phytochemicals such as alkaloids, flavonoids, terpenoids, tannins, or glycosides that collectively work to improve physiological functions or treat particular conditions. The blending of herbs can also target multiple pathways in the body, offering broad-spectrum therapeutic benefits and improving it[5,6].

Current Demand for Polyherbal Products:

In recent years, the demand for polyherbal products has seen a significant rise due to growing consumer awareness about natural, safe, and holistic alternatives to synthetic drugs and cosmetics. With increasing concerns over the side effects of chemical-based products, people are turning to herbal solutions that are not only effective but also promote long-term health and wellness. The shift

toward plant-based lifestyles, clean beauty, and organic healthcare has further accelerated the popularity of polyherbal formulations in both therapeutic and cosmetic sectors.

In the field of cosmetics, polyherbal products are gaining attention for their ability to offer multiple benefits such as anti-aging, skin brightening, acne control, and hair nourishment by combining the power of various medicinal herbs. Similarly, in herbal medicine, these formulations are used for managing chronic conditions like diabetes, inflammation, digestive issues, and immunity support, often providing better results due to their multi-targeted action[7,8].

POLYHERBAL FACE SERUM

A polyherbal face serum is a skincare formulation made by combining extracts from two or more medicinal plants, specifically chosen for their skin-enhancing and therapeutic properties. Unlike single-herb products, polyherbal serums provide a broader range of benefits due to the synergistic action of multiple herbal ingredients. These serums are typically lightweight, fast-absorbing, and rich in natural bioactive compounds such as antioxidants, vitamins, flavonoids, and essential oils.The main goal of a polyherbal face serum is to nourish, protect, and rejuvenate the skin. Common benefits include improving skin texture, reducing pigmentation, controlling acne, minimizing signs of aging, and enhancing overall radiance. Herbs like Aloe vera, Turmeric, Neem, Sandalwood, Manjistha, and Licorice are often used for their anti-inflammatory, antimicrobial, and skin-brightening effects.Polyherbal serums are especially popular among those seeking natural, chemical-free skincare alternatives. They are suitable for various skin types and are generally considered safe for long term use, provided the ingredients are properly selected and formulated[8,16,17].

PLANT PROFILE

Daucus carota

A carrot is an orange root vegetable from the biennial herb “Daucus carota” that is rich in beta-carotene and antioxidants, which are converted to vitamin A in the body. Originating in Central Asia and brought to the modern orange form by Dutch growers, carrots are a popular, versatile food eaten raw or cooked worldwide. Carrots support eye and skin health, aid in weight management due to their fiber and low calorie content, and contain vitamins C and K, important for bone health. Biological Source: The dried or fresh roots of “Daucus carota Linn,” known as Carrot, and the volatile oil obtained from its seeds are used medicinally[13].

Taxonomical Classification

Kingdom: Plantae

Division: Angiospermae

Class: Dicotyledonae

Subclass: Polypetalae

Series : Calyciflorae

Order:Apiales

Family:Apiaceae (Umbelliferae)

Genus: Daucus

Species: Daucus carota Linn.

Vernacular Names

- English: Carrot
- Hindi: Gajar
- Tamil: Carrot

• Sanskrit: Grinjana

• Kannada: Gajjari

Morphological Character

• **Root**

o Tapering cylindrical, conical in shape, fleshy, orange-red in color.

o Outer surface smooth; core (xylem) paler. Plant Profile

o Odour is aromatic, tastes sweet.

• **Leaves:**

o Pinnately divided, finely dissected, green.

•**Flowers:**

o Small, white, arranged in compound umbels.

•**Fruits (Seeds):**

o Cremocarp type (two mericarps), oval, brownish, with spiny projections.

Microscopic Characters (Root Section)

- **Cork:** Several layers of tangentially elongated brown cells
- **Cortex**: Contains parenchyma with chromoplasts (carotenoid pigments).
- **Endodermis**: Well marked.
- **Vascular Bundles**: Collateral and open; xylem towards center, phloem towards periphery.
- **Secondary Xylem:** Forms a distinct central core.
- **Storage Tissues**: Parenchyma filled with sucrose, starch granules, and carotenoids

Chemical Constituents

•**Carotenoids**: β-carotene (main pigment and provitamin A), α-carotene, lutein.

•**Sugars**: Glucose, sucrose, and fructose.

•**Volatile Oil:** From seeds, containing carvone, limonene, daucene, and asparagine.

•**Vitamins:** Vitamin A (as β-carotene), Vitamin B complex, Vitamin C, vitamin K.

• **Minerals**: Calcium, potassium, phosphorus, iron [1,4,13].

Uses

• **Nutritional**: Source of provitamin A (β-carotene).

•Medicinal:

- Acts as a diuretic, carminative, stimulant, and antiseptic.
- Carrot seed oil is used in flavoring and perfumery.
- Used in vitamin A deficiency, night blindness, and skin disorders.
- Fresh juice is used as an antioxidant and liver tonic.

•Cosmetic Use: Carrot oil and extract used in creams, lotions, and anti-aging formulations[10,16].

Rich Source of Vitamin A (Beta-Carotene)

• Carrots are high in beta-carotene, which the body converts into vitamin A.

Uses:

- Carrots support eye health and prevent night blindness.
- Strengthens the immune system.
- Maintains healthy skin, mucous membranes, and organ function.

Antioxidant Properties

• Carrots contain powerful antioxidants like beta-carotene, lutein, and vitamin C.

Uses:

• Helps protect cells from oxidative stress.

• It May reduce the risk of chronic diseases such as cancer and heart disease.

• Slows down aging and supports healthy skin[6,21].

Heart Health

• Carrots contain potassium, fiber, and antioxidants.

• Helps lower blood pressure.

• Reduces cholesterol levels.

• Supports overall cardiovascular health[23,24].

Digestive Health

It promotes healthy digestion and prevents constipation.

Anti-Cancer Properties

Some studies suggest carrots may reduce the risk of certain types of cancer.

Uses:

- Antioxidants in carrots may protect against colon, lung, prostate, and breast cancer by neutralizing harmful free radicals.
- Falcarinol, a compound in carrots, has shown potential anti-cancer effects in lab studies.

Blood Sugar Regulation

- Carrots have a low glycemic index and contain nutrients like fiber and carotenoids.

Uses:

- Helps stabilize blood sugar levels.
- Can be safely included in a diabetic diet when eaten in moderation.

Immune System Boost

- Vitamins A and C, along with antioxidants, support immune function.

Uses:

- Helps the body fight infections.
- Supports the function of white blood cells.

Skin and Wound Healing

- Carrot extracts are used in natural remedies and skincare.

Uses:

- Helps heal wounds and reduce skin inflammation
- Carrot seed oil is used to treat dry skin, eczema, and wrinkles.
- Strengthens bones and teeth in the growing baby[1,4,13].

MATERIALS AND METHODS:

Collection of plant material: The carrots were collected in the month of August from the local market. It is a common vegetable that is taken in our food.

The curry leaves and aloe Vera leaves were in our hometown.

EXTRACTION:

Pasteurized Aloe Vera extract:

The fresh leaves of aloe Vera were collected and cut to drain the yellow latex. It is traditionally used as a natural laxative, but it may cause severe side effects like skin irritation. Using a spoon, blend it into a gel in a blender and filtered to remove fibers using muslin cloth, pour it in a beaker, then heat it in a heating mantle for about 70–75 ^{o}C and cooled in a refrigerator several times and immediately used in the pharmaceutical formulation because it has a shorter self-life[9,14,28].

Pasteurized carrot extract:

The fresh carrots were washed and peeled off the outer layer, then cut into small pieces and a small amount of water is added to

them and blended them in a blender to a smooth paste. The smooth paste is filtered through a white and clean muslin cloth to remove the dust and fibers to obtain a fresh juice of a carrot. The fresh juice is taken into a beaker and heated it in a heating mantle with the temperature of about 70–75 C and cooled in a refrigerator. The pure white colored extract of carrot is obtained. The pasteurized extract has a shorter self-life. Therefore, it degrades within one or two days, so it is immediately used in the formulation [6,13].

Pasteurized curry leaves extract:

The fresh curry leaves were collected and removed the damaged ones and washed them through running tap water to remove dust and foreign particles. The pure distilled water is boiled to about 60–62 C and cooled for sometimes and add the fresh curry leaves to the water and boiled for 15–20 minutes then filtered through a clean muslin cloth. The filtered extract is stored in a refrigerator, and then it is used in a poly-herbal formulation these extract has a shorter self-life compared to other methods of extraction. So, it is immediately used to prepare pharmaceutical formulations[7,15,19].

Table 1: Formulation composition of Poly herbal face serum

S.No	MATERIALS	QUANTITY 10%	QUANTITY 20%
1	Carrot extract [pasteurized]	5ml	10 mL
2	Aloe Vera gel [pasteurized]	5ml	10ml
3	Carry leaves extract [pasteurized]	1ml	1ml
4	Distilled water	35.6ml	25.6 mL
5	Glycerin	1ml	1ml
6	Jojoba oil	0.1ml	0.2ml
7	Vitamin E	0.1ml	0.2ml
8	EDTA solution	2ml	2ml
9	Geogard ECT	0.5ml	0.5ml
10	Essential oils [optional]	1-2 drops	1-2 drops

EVALUATION OF POLY-HERBAL FACE SERUM

The prepared poly-herbal face serum is further evaluated for its safety efficacy and therapeutic effectiveness.

pH test:

To perform a pH test on a poly-herbal face serum using a pH meter, calibrate the meter with a standard buffer solution, then dilute a small amount of the serum in distilled water, and finally measure the pH of the solution with the calibrated meter. The serum's pH should ideally fall within the acidic range of 4.1to 6. 7 to be compatible with the skin[26].

Spreadability:

Spread-ability test measures how well it spreads on the skin, which is crucial for even application of a standard dose. To perform the test, a known weight of the serum is placed on a surface or between two slides, and then the time taken for the product to spread over a specific distance or for a weight to move is measured. This can be quantified in units like seconds, g/cm/sec, or by measuring the spread in centimeters[26].

Skin irritability test:

To test a polyherbal face serum for skin irritability, perform a patch test by applying a small amount to an inconspicuous area of your skin, like behind the ear or on the inner arm, and wait 24-48 hoursfor any signs of redness, itching, or irritation. While poly-herbal serums use natural ingredients, they can still cause irritation due to potent extracts or the serum's high concentration, so patch testing is crucial for sensitive skin][17.18].

Stability studies:

Stability studies for a poly-herbal face serum evaluate its physical and chemical integrity over time by subjecting it to various environmental conditions, such as accelerated temperatures and humidity, following ICH guidelines. Key parameters assessed include physical appearance (color, clarity), viscosity, pH, and the absence of phase separation or changes in globule size. These tests are critical to ensure the serum maintains its quality, safety, and efficacy for consumers[11,12].

RESULT AND DISCUSSION

Table 2: Phytochemical Analysis

Phytoconstituents	Carrot Extract	Aloe vera Extract	Curry Leaf Extract
Carbohydrates	+	+	+
Proteins & Amino acids	–	+	+
Alkaloids	–	–	+
Flavonoids	+	+	+
Phenolic compounds	+	+	+
Tannins	–	+	+
Saponins	–	+	+
Terpenoids	+	+	+
Glycosides	–	+	+
Fixed oils	+	–	+
Vitamins(A,E,C)	+	+	–

Organoleptic Evaluation

Table 3: Organoleptic Evaluation of Serum

Parameter	Observation	Inference
Colour	Light orange to pale yellow	Acceptable
Odour	Pleasant herbal aroma	Characteristic
Consistency	Smooth and non-sticky	Suitable for topical application
Appearance	Homogeneous and clear	Uniform mixture

EVALUATION OF POLY HERBAL FACE SERUM

Table 4: Evaluation of Poly Herbal Face Serum

Parameter	10% Serum	20%Serum	Standard Range	Observation
Colour	Pale yellow	Ligh to range	Acceptable	Uniform
Odour	Pleasant herbal	Pleasant herbal	Acceptable	Non-irritant
pH	5.7±0.2	5.5±0.1	5.0–6.0	Suitable for skin
Viscosity(cP)	120	135	100–150	Ideal consistency
Spreadability (g·cm/sec)	8.2	8.5	>7	Good spreadability
Homogeneity	Uniform	Uniform	-	Stable
Stickiness	Non-sticky	Non-sticky	-	Acceptable
Stability(30days)	Stable	Stable	-	No phase separation
Skin irritation	Nil	Nil	-	Non-irritant

The pH was within the physiological skin range (5.0–6.0), minimizing irritation risk. The viscosity and spreadability were optimal, ensuring smooth and even application without greasiness. The formulation remained stable for 30 days under ambient and accelerated conditions, indicating good shelf life. No microbial growth was detected, proving the efficacy of Geogard ECT as a natural preservative. The non-sticky texture and soothing herbal aroma increased aesthetic acceptability. Phytochemical results confirm that the serum contains bioactive antioxidants (carotenoids, flavonoids, phenolics, terpenoids) that help in: Reducing oxidative damage, Promoting skin elasticity, Enhancing glow, Preventing acne and pigmentation.

CONCLUSION:

The formulated polyherbal face serum containing Carrot, Aloe vera, and Curry leaf extracts demonstrated excellent stability, safety, and cosmetic efficacy. Phytochemical screening confirmed the presence of bioactive compounds with antioxidant, anti-inflammatory, and moisturizing properties. Overall, the serum provides a natural alternative to synthetic formulations for promoting healthy, radiant, and well-nourished skin.

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