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Development and Assessment of An Anti-Oxidant Cream by Using Natural Herbs

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Abstract: *As the largest and most external organ of the human body, the skin experiences aging both from intrinsic and extrinsic causes. Skin aging encompasses different structural and functional changes that occur as a person ages, such as wrinkles, skin thinning, decreased skin elasticity, skin roughening, etc. Skin care products are available in different formulations, such as solids, semi-solids and liquids. Semi-solid formulations include creams, ointments, and pastes, which are among the most commonly used forms of skin care products. A cream is an oil-in-water emulsion intended for topical application to the skin. Antioxidants are a broad spectrum of different compounds that reduce or prevent the harmful effects of free radicals on tissues in the human body. Fenugreek (Trigonella foenum-graecum) is a strong antioxidant due to the many flavonoids and polyphenols it contains. Coconut oil is an oil obtained from the meat of mature coconuts (Cocos nucifera) and has antioxidant, anti-inflammatory and antimicrobial activity. The purpose of the research is to formulate and evaluate an herbal antioxidant cream using natural ingredients, with an emphasis on the degree of positivity that these herbs provide for skin health.*

Keywords: Fenugreek seeds (Trigonella-Foenum Graecum), Coconut oil, Skin, Skin-aging, Anti-oxidants, cream, etc

I. INTRODUCTION

The human skin is the primary protection against external-assaults from the environment that could potentially damage the body. Skin assists with temperature and hydric regulation as well as its role in immune responses. The skin has a total surface area of ~1.5 – 2 m2, so the structure and cellular payload of the skin work in tandem to avoid infections and accommodate the physical and chemical challenges humans face. Skin aging is a complex biological process based on intrinsic and extrinsic factors. Intrinsic skin aging is typified by time-related changes in skin elasticity while extrinsic aging includes skin damage from UV light, pollution and smoking. UV-radiation exposure is one of the most significant causes of skin aging. As skin ages, it undergoes significant changes to its structure and function, resulting in depletion of functional capacity and even an increased frequency of adverse skin conditions and dermatological diseases. Skin cells are almost continuously under attack from free radicals induced via endogenous and exogenous factors. Although the skin has some natural defenses against free radicals, excessive free radicals can results in skin. The skin cells are continuously under the detrimental effects of free radicals generated from endogenous and exogenous sources. The skin has systems that can withstand free radical formation, but an excess can lead to damage. Free radicals are capable of destroying lipid structures, oxidizing polyunsaturated fatty acids (PUFAs), and interfering with natural skin defense and repair mechanisms, and repair mechanisms. Pharmaceutical formulations that are used for skin care, including herbal cosmetics, may contain isolated bioactive compounds or crude phytoextracts that may provide natural ingredients to try to treat skin aging and provide healthy skin. There are many bioactive compounds found in phytoextracts, including, phenolics, flavonoids, and carotenoids, which are sources of beneficial antioxidant and UV protective ingredients in skin care products.The assortment of skin care products includes solids, semi-solids, and liquids. Semi-solid preparations such as creams, ointments, and pastes, are common for skin applications. Creams, specifically, are emulsions made from oil and water and, may be an effective delivery vehicle for topical products.The creams are used topically to protect and treat the skin

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problems including hyper pigmentation and wrinkle. The preparations of herbal creams may not conform to the approach described above with some modifications of using isolated photochemical or the extracts with appropriate compositions of the necessary constituents that typically are needed for contain creams with admirable attributes. Antioxidants are molecules that prevent or reduce the damaging effects of free radicals on human tissues. They are a chemically heterogeneous group of compounds distinguishable based on structure, solubility and reaction kinetics.Fenugreek (Trigonella foenum-graecum) is an example of a traditional medicinal herb from the leguminous family of plants that have been utilized for thousands of years to treat a variety of diseases, including diabetes, cancer, and inflammation. Fenugreek's medicinal value is attributed to its anti-diabetic, anti-cancer, anti-microbial, anti-oxidative, and anti-inflammatory properties. In traditional medicine, fenugreek's leaves and seeds have been used to promote health and well-being. Its antioxidant effect appears mainly attributable to its high levels of flavonoids and polyphenols, compounds that scavenge free radicals and limit the potential damage of oxidative stress. Rutin, a bioactive compound in fenugreek, has been studied for its anti-aging and antioxidant effect.It has also been found to inhibit collagen breakdown making fenugreek a potential candidate for use in cosmetic products. Fenugreek's anti-inflammatory activity is attributed to flavonoid content; which serve as antioxidants and suppress pro-inflammatory enzymes. This makes fenugreek a potential natural agent for inflammation-associated disorders.Essential oils are naturally produced from varying materials from plants; including flowers, leaves, roots, seeds, fruit, wood, bark, and resin. They have been shown to demonstrate many biological properties and medicinal applications, including anti-inflammatory, antioxidant, and antibacterial. Coconut oil, from the mature flesh of coconuts (Cocos nucifera), has been utilized in traditional medicine for its therapeutic properties over centuries. Coconut oil is composed of a variety of medium-chain triglycerides (MCT's), including lauric acid, capric acid, and caprylic acid which shows: Antimicrobial, Anti-Inflmmatory, Anti-oxidant, wound healing, etc.

II. MATERIALS AND EQUIPMENTS

2.1 MATERIALS:

2.1.1. Fenugreek seeds

- Synonym: Methi, Trigonella foenum-graecum, Greek hay
- Biological Source: It consists of dried ripe seeds of Trigonella foenum-graecum
- Family: Fabaceae
- Geographical Source: Western Asia, and parts of North Africa, India, Egypt, and Greece.
- Chemical Constituent: Diosgenin, Saponins, Flavonoides, Galactomanan
- Use : Antioxidant and anti-microbial agent

Figure 1: Fenugreek Seed Trigonella foenum-graecum

2.1.2. Coconut Oil

- Synonym: Virgin Coconut Oil, Cold-Pressed Coconut Oil, Refined Coconut Oil.
- Biological Source: The biological source of coconut is Cocos nucifera, a tropical tree

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- Family: Arecaceae
- Geographical Source: Tropical regions of Southeast Asia and the Indian subcontinent. Indonesia, the Philippines, Malaysia, and India.
- Chemical Constituent: Coconut oil is a triglyceride consisting of glycerol groups and medium chain fatty acids (MCFA).
- Use : Anti-microbial, Anti-inflammatory, Anti-oxidants, Wound healing.

Figure 2. Coconut Oil

2.1.3.Aloe Vera

- Synonym: Aloe barbadensis Mill., Aloe indica Royle, Aloe perfoliata L. var. vera and Aloe vulgaris Lam
- Biological Source: Aloe is obtained from the dried juice of leaves of Aloe Barbadensis Miller.
- Family: Liliaceae.
- Geographical Source: Aloe Vera is native to Africa, but it is now cultivated in many parts of the world with tropical and subtropical climates.
- Chemical Constituent: It contains anthracene glycosides, cinnamic acid, coumaric acid, and vitamins A, B and C.
- Use : It is used to treat skin problems. It is used as anti-bacterial and anti-inflammatory agent. It is used for hydrating the skin. It is used for softening of the skin.

Figure 3. Aloe Vera

2.1.4.Vitamin-E

- Botanical Name: Tocopherol
- Synonyms : Alpha – Tocopherol

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- Chemical constituents : α -, β -, γ - and δ -Tocopherols
- Uses : Emollient

Figure 4. Vitamin E

2.1.5.Almond oil

- Synonyms: Almond hull extract, Almond oil Bitter
- Biological Source: Almond oil is extracted from the kernels of almonds, which are the edible seeds of the almond tree (Prunus dulcis).
- Family: Rosaceae
- Geographical Source: Almonds grown in regions with Mediterranean climates, including countries bordering the Mediterranean Sea, Iran, and North Africa.
- Chemical Constituents: Oleic acid, Linoleic acid, Palmitic acid, Stearic acid and a little of palmitoleic acid
- Uses: Moisturizer, lessens sun damage, Fragrance

Figure 5. Almond oil

2.1.6. Bees wax

- Synonyms : Cera alba, candle wax, crude wax
- Biological Source: Beeswax, a natural wax, is produced by worker honeybees (specifically those in the genus Apis) from specialized wax glands located on the underside of their abdomens
- Family : Apidae
- Geographical Source:Beeswax, a natural wax produced by honeybees, is a geographical product, sourced from honeycombs built by honeybees of the genus Apis, with the European honeybee (Apis mellifera) being the primary commercial source.

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- Chemical Constituents : Esters of fatty acids and fatty alcohols, paraffinic hydrocarbons, and free fatty acids
- Uses : As stiffening agent, A natural emulsifier, and as base

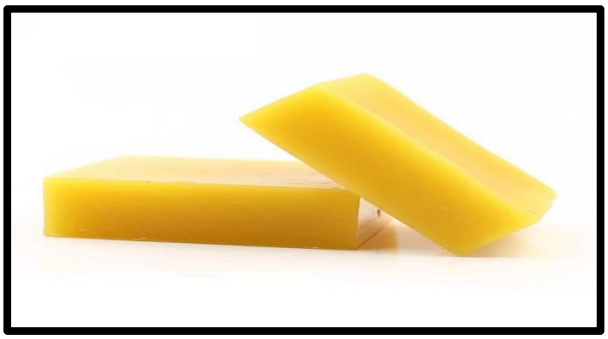

Figure 6. Bees wax

TABLE 1: ROLE OF INGREDIENTS

Sr. No	INGRIDENTS	ROLE OF INGRIDENTS
1	Fenugreek seeds	Antioxidant, antimicrobial, anti-inflammatory
2	Coconut Oil	Anti-microbial, Anti-inflammatory, Anti-oxidants, Wound healing.
3	Aloe Vera	Moisturizer, anti-acne, anti-microbial
4	Vitamin E	Emollient
5	Almond Oil	Moisturizer, lessens sun damage, Fragrance
6	Bees wax	Emulsifying agent, stabilizer, and base

2.2. EXTRACTION PROCESS:

2.2.1. Fenugreek seeds extraction:

Use a clean beaker and add 8-10 spoonfuls of fenugreek seeds. Optionally, you can lightly crush these seeds using a blender before use. Pour 40-50 ml of water into the beaker containing the fenugreek seeds.Heat the mixture to 75°C and maintain this temperature for 20-30 minutes.After heating, filter the mixture through muslin cloth to remove solid particles and impurities. The resulting filtered fenugreek extract is now ready for your intended preparation.

Figure 7. Fenugreek seeds extraction

2.2.2. Aloe Vera gel extraction:

Mature, healthy and fresh aloe vera leaves were collected washed with distilled water. Then after proper drying of leaves in hot air oven, the outer part of the leaf was dissected longitudinally using a sterile knife. Then the aloe vera gel that is the colorless parenchymatous tissue was removed using the sterile knife. Then it is filtered using muslin cloth to remove the fibers and impurities. Then the filtrate or the filter product which is a clear aloe vera gel was used in preparations.

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Figure 8: Aloe vera gel extract

2.2. EQUIPMENTS:

Sr.NO.	LIST OF EQUIPMENTS
1	Slab and spatula
2	Digital pH meter
3	Viscometer
4	Spreadability slides

TABLE 2: LIST OF EQUIPMENTS

III. FORMULA

TABLE 3: FORMULATION OF THE CREAM

Sr.NO.	INGREDIENTS	QUANTITY GIVEN (100gm)	QUANTITY TAKEN(30gm)	USES
1	Fenugreek seeds extract	42 ml	10 ml	Antioxidant, antimicrobial
2	Aloe Vera extract	19 ml	7.5 ml	Anti-bacterial, moisturizer
3	Coconut oil	15 ml	6.0 ml	Antioxidant, anti-inflammatory
4	Almond oil	8 ml	1.0 ml	Fragrance, moisturizer
5	Vitamin-E	3.0 ml	1.5 ml	Nutrients, Emollient
6	Bees wax	12 gm	4.0 gm	Base
7	Distilled water	Q.S	Q.S	Q.S

IV. FORMULATION

1. Preparation of Oil Phase:

In the first beaker, combine beeswax and tea tree oil.

Heat this mixture in a bain-marie to 75° C, maintaining this temperature until the beeswax melts completely.

2. Preparation of Aqueous Phase:

In the second beaker, add fenugreek seeds and distilled water.

Heat this mixture in a bain-marie to 75° C for 20-30 minutes to extract the active components from the fenugreek seeds.

3. Emulsion Formation:

Slowly add the heated aqueous phase to the oil phase while stirring continuously.

Incorporate aloe vera gel and vitamin E into the mixture.

Stir vigorously until a smooth cream forms.

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4. Addition of Fragrance:
Add a few drops of almond oil to the cream as a fragrance.

5. Slab Technique Mixing:
Transfer the cream onto a clean slab.
If necessary, add a few drops of distilled water.
Use the spatula to mix the cream geometrically on the slab, ensuring all ingredients are thoroughly combined and the cream achieves a smooth texture.

V. EVALUATION

1. Physical Evaluation:
The cream underwent a visual examination to assess its:
1. Color: Checking for any discoloration or uneven tone.
2. Odor: Evaluating the scent and presence of any unpleasant smells.
3. Texture: Assessing the cream's smoothness, consistency, and feel.
4. State: Verifying the cream's physical form and stability.

2. Spreadability Test:
The spreadability of the cream was evaluated using the parallel plate method:
1. Two 20x20 cm glass slides were selected.
2. Approximately 1g of the cream was placed on one slide.
3. The second slide was positioned on top, sandwiching the cream.
4. A 125g weight was added to ensure uniform pressure.
5. The weight was removed, and the resulting smear was measured to assess the cream's spreadability.

3. Diffusion Test:
This test measures how easily the cream spreads and absorbs into the skin:
1. A small amount of cream is applied to the skin surface.
2. The cream's ability to diffuse and spread evenly across the skin is observed.
3. The test assesses the cream's ability to penetrate and absorb into the skin.

4. Stability Test:
This test evaluates the cream's stability over time, checking for:
1. Visible disturbances
2. Phase separation
The test involves regular observations of the cream over a set period, ensuring its consistency and quality remain unchanged.

5.Irritancy Test:
This test assesses the potential of the cream to cause skin irritation:
1. A 1 cm^2 area on the dorsal surface of the hand was marked.
2. The cream was applied to the marked area, and the time was recorded.
3. The area was monitored for signs of irritancy, redness (erythema), and swelling (oedema) at regular intervals over 24 hours.

6.Washability Test:
A small amount of cream was applied on the hand and it is then washed with tap water.

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7.Homogeneity Test:
This test evaluated the uniformity of the cream formulation:
1. The cream was allowed to set in a container.
2. A visual inspection was conducted to check for consistency and texture.
3. The appearance of the cream was observed, and any signs of aggregation or separation were noted.

8.Viscosity Test:
This test measured the cream's viscosity over time:
1. Viscosity readings were taken at regular intervals using a viscometer.
2. Measurements were recorded at two temperatures:
   - Room temperature
   - Elevated temperature (45°C)
3. Changes in viscosity were monitored to assess the cream's stability and flow characteristics.

9.pH:
The pH of the cream was determined by using the pH paper.
10.Greasiness Test:
This test evaluated the cream's greasiness:
1. A small amount of cream was applied to the skin surface as a smear.
2. The smear was observed to check if it felt oily or greasy.
3. Results showed that the cream formulation had a non-greasy texture.

TABLE 4: PHYSICAL EVALUATION OF CREAM

Sr.NO	PARAMETER	OBSERVATION
1	Colour	Faint green
2	Odour	Pleasant
3	Texture	Smooth texture
4	State	Semi-solid

TABLE 5: EVALUATIONS OF CREAM

Sr.NO.	TESTS	OBSERVATIONS
1	Spreadability test	Easily spread
2	Diffusibility test	Easily diffused
3	Stability testing	NO phase separation
4	Irritation effect	NIL
5	Edema	NIL
6	Erythema	NIL
7	Washability test	Easily washable
8	Homogeneity	NO aggregates formed (Good homogeneity)
9	pH	6.8 – 7.1
10	Dye test	O/W type cream

VI. RESULT

The formulated antioxidant cream using natural ingredients including fenugreek seed extract, aloe vera gel, coconut oil, almond oil, beeswax, and vitamin E was successfully developed and evaluated. The cream exhibited:
Good physical properties with a faint green color, pleasant odor, and smooth texture.
Excellent spreadability and diffusibility, indicating good application performance.
Stability with no signs of phase separation or aggregation over the observation period.
Non-irritant behavior on human skin, with no observed signs of erythema or edema.
pH in the range of 6.8 to 7.1, suitable for skin application.

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Oil-in-water (O/W) emulsion type, ensuring better skin absorption and non-greasy feel.
Easy washability, enhancing user convenience.

VII. CONCLUSION

The study concludes that the herbal antioxidant cream formulated with fenugreek extract and other natural components demonstrates promising potential as a safe, stable, and effective topical formulation for skincare. It provides antioxidant, moisturizing, and healing benefits, making it a viable natural alternative to commercial skin creams. The cream's pleasant aesthetics, non-irritant nature, and skin-friendly pH suggest it could be used regularly for skin protection and rejuvenation.

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