



Development And Characterization Of Polyherbal Gel For Skincare Using Liquorice, Wheat Germ Oil And Aloe Vera

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ABSTRACT

Herbal face gels are gaining popularity in skincare for their lightweight, non-greasy formulations that provide hydration and various skin benefits without the heaviness of creams or lotions. The main goal was to develop a multipurpose skincare gel that offers antioxidant benefits along with anti-aging, anti-hyperpigmentation and hydrating properties while having fewer negative effects than synthetic products. Here the key ingredients such as wheatgerm oil, liquorice and aloe vera were combined to create the formulation in a gel base consisting of Tween 80 (emulsifier), glycerine (humectant), and Carbopol 940 (gelling agent), stabilized with tartaric acid and sodium benzoate as preservatives. The gel's pH was set between 5.5 and 6.5 to guarantee skin compatibility. Three formulations were made by slightly varying the concentration of the ingredients and organoleptic characteristics such as appearance, texture and spreadability, as well as pH, stability and antioxidant property, were assessed for the gel. The second formulation had an optimal pH, silky consistency and excellent spreadability and homogeneity. It had a smooth, non-sticky texture with off-white appearance that was perfect for topical application. Thus according to the findings, the second formulation was found to be the most reliable, safe and effective skincare product that works well for a variety of skin types.

Key words: Herbal face gel, Wheatgerm oil, Aloe vera, Liquorice extract, Anti-Hyperpigmentation, Antioxidant, Skincare.

INTRODUCTION

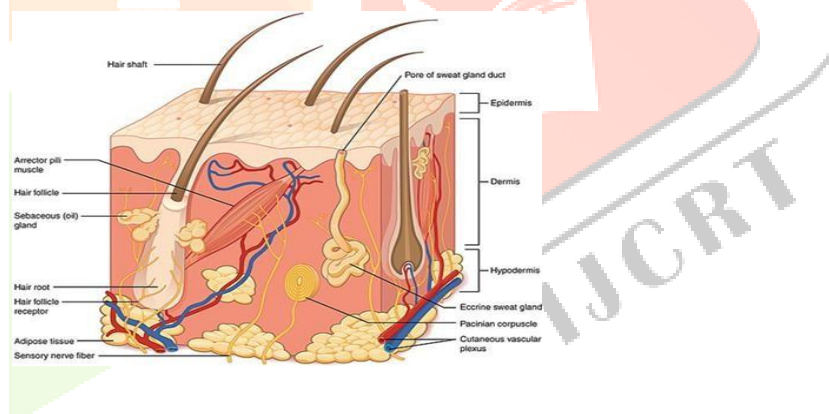
The term “cosmetic” originates from the Greek word “kosmeticos”, meaning to decorate or beautify. Cosmetics are substances or objects that are applied to the human body, especially to the nails, skin and hair, in order to beautify, enhance beauty, purify or alter appearance without altering the body's function or structure. They have a crucial role in personal grooming and self-care, offering a variety of products that cater to enhancing physical appearance and maintaining hygiene.

Cosmeceutical or cosmetic substances are topical agents that offer both cosmetic and therapeutic benefits. The term “Cosmeceutical”, uniting the word “cosmetic” and “pharmaceutical” was popularized by Dr Albert Kligman in 1980s.

Herbal cosmetics are products that contain phytochemicals from a range of botanical sources that affect skin function and supply nutrients essential for a healthy body and skin. These products are used for skin care, hair care and general beauty treatments, providing a natural alternative to chemical-based products.

STRUCTURE OF SKIN

The skin, which covers the whole exterior of the body, is the biggest organ. The epidermis, dermis and hypodermis are its three layers and each has a very different structure and purpose.



Structure of skin

Epidermis

The uppermost layer is called the epidermis. Skin colour is determined by this hydrophobic layer. There are no vessels for blood in the epidermis. Melanocytes generate the pigment known as melanin, which gives the skin a tone. The epidermis contains these:

Layers of epidermis

Stratum corneum (the outermost layer of the epidermis), stratum spinosum, stratum lucidum, stratum granulosum, and stratum basale (the innermost layer) comprise the various layers of the epidermis.

Stratum basale, the innermost layer is called stratum basale or stratum germinativum. Hemidesmosomes connect it to the basal membrane, which divides it away from the dermis. This layer contains cuboidal to columnar stem cells that are continuously generating keratinocytes through mitosis.

Stratum spinosum, the bristle cell layer, which comprises 8–10 unique polyhedral cells with intracellular processes (sometimes referred to as spines) that expand outside and create interaction with adjacent cells by desmosomes. Within this layer dendritic cells are identified.

Stratum granulosum, diamond-shaped cells with keratohyalin and lamellar granules are seen in layers three to five. Keratin precursors seen in keratohyalin granules gradually combine, interconnect and produce bundles. The glycolipids that are released to the cell surface and act as glue to hold the cells intact are found in the lamellar granules.

Stratum lucidum, cells two to three layered, consists of eleidin, an intermediate form of keratohyalin and is a fragile, translucent layer.

Stratum corneum, the topmost layer comprises 20–30 layers of cells, which are composed of keratin and horny scales composed of anucleate squamous cells, which are deceased keratinocytes. The depth of this layer of skin differs by far.

Dermis

The human body is protected against exertion and tension by the dermis, which acts as muscle tissue. Additionally, it makes the skin supple and strong. Also, the dermis is linked to the cells that sense heat (thermoreceptors), pressure (mechanoreceptors) and pain (nociceptors).

Hypodermis

The hypodermis is mostly composed of connective tissue, lipids and collagen, a flexible molecule that aids in the tissues' ability to regain their original form while being strained. The body of an individual is better protected and keeps from generating excess energy owing to a large amount of fat. In addition to providing safety, the lipids layer supports the bones along with muscles.

FACE GEL

Face gel is a type of skincare product formulated with a lightweight, gel-like consistency, designed to provide hydration, soothing and other skincare benefits without the heaviness often associated with creams or lotions. Face gels are particularly popular for individuals with oily or combination skin, as they tend to absorb quickly and leave a non-greasy finish. Gels are described as partially rigid structures where the dispersion medium's motion can be limited through a force interacting three-dimensionally.

scattered phase matrix containing dissolved molecules as well as fragments. Clarity range originates in clear to a whitish translucent.

Classification of gel:

Gel may be classified based on nature of continuous phase

1. Hydrogel (water based)
2. Organogels (with a non-aqueous solvent)
3. Biological xerogels

Hydrogels

Hydrogel is a hydrophilic system of polymeric chains that can occasionally be observed to be a colloidal gel that contains water acting as a dispersing agent. One 3D cross connections link hydrophilic chains of polymers and leading to a solid material. The gel-like network's strength is intact with the elevated water content due to the presence of natural cross-links. Hydrogels typically frameworks of either synthetic or organic polymers that are extremely permeable. Hydrogels have a considerable amount of water, which gives them an extent of elasticity that is quite comparable to that of real tissue. Hydrogels are "intelligent polymers" that may react with external stimuli, which include alterations, by encasing systems of chemicals in gel-sol may change to a form of water due to pH. The word "hydrogel" started out in the literature in 1984.

Example: gelatin, cellulose derivatives, bentonite magma.

Organogels

Organogels can be a thermoreversible substance that is non-crystalline and non-glassy, made up of a fluid substance trapped in an array of cross-links in all three dimensions. Example: vegetable, either mineral oil or an organic solvent. The particle and solubility dimensions structure proportion are crucial factors in determining the hardness and elastic qualities of organogels. Often the structural components' assembling is the foundation of these networks.

Xerogels

When gel is dried with uncontrolled distortion, xerogels, which are solids, occur. It usually keeps its enormous solubility (15–50%) stir-facial region (150-900m² /gm), in addition to the extremely tiny dimensions of pores (1-10nm). An extremely permeable, not very dense substance called aerogel. It is created if a solvent is withdrawn below extreme conditions without causing the pores to shrink. Higher heat treatment of a xerogel results in viscous sintering process which ultimately turns the permeable gels towards dense glasses.

Example: gelatin sheets, acacia tears, dry cellulose and polystyrene, and tragacanth ribbons.

HERBAL FACE GEL CONTAINING WHEATGERM OIL, LIQUORICE AND ALOE VERA

Face gels are gaining popularity in skincare for their lightweight, non-greasy formulation that provide hydration and various skin benefits without the heaviness of creams or lotions. But they may or may not cause side effects to certain people especially with sensitive skin. Here comes the use of herbal face gels. They contain natural herbs and thus are natural herbal preparations used for their fragrant value in cosmetic preparation. Their main advantage is that chances of side effects are very less since there are no harsh chemicals in this preparation. This increases their reliability and safety. Thus, here we formulated a herbal face gel where wheat germ oil, aloe vera, and liquorice extract are the key ingredients which when used in combination helps to fight problems like hyperpigmentation and premature aging.

Important characteristics of this face gel formulation are:

- Hydration
- Lightweight texture
- Cooling and soothing effects
- Quick absorption
- Anti-ageing and brightening benefits
- Non-comedogenic



MECHANISM OF ANTIOXIDANT ACTIVITY EXHIBITED BY ACTIVE INGREDIENTS

- **Liquorice:**
 - **Boosting the Natural Defenses of the Skin:** The following natural antioxidant enzymes are upregulated by liquorice compounds: SOD or superoxide dismutase, the enzyme catalase and glutathione peroxidase. These strengthen the skin's defenses against oxidative damage.
 - **Prevention of Inflammatory Routes:** Here Inflammatory signaling, such as NF- κ B, can be triggered due to oxidative stress. These pathways are downregulated by liquorice extract, which reduces inflammation and further oxidative damage.
 - **UV Defense:** By absorbing UVB rays and lowering UV-induced ROS production, flavonoids found in liquorice help shield skin from photoaging.

- **Wheatgerm oil:**

- **High Tocopherol Content in Vitamin E:** A strong lipid-soluble antioxidant, vitamin E works against oxidative damage caused to cell membranes. It helps preserve the hydration and integrity of the skin by scavenging lipid peroxyl radicals and preventing lipid peroxidation
- **Cuts Off Free Radicals:** Superoxide and hydroxyl radicals, which fasten aging and skin corrosion, are directly minimised by wheat germ oil.
- **Encourages Skin Repair:** The antioxidant impact promotes the rebuilding of injured skin cells and prohibits the breakdown of collagen. It helps to lessen oxidative stress-related wrinkles, blemishes, creases and hyperpigmentation.

- **Aloe vera:**

- **Packed with Vitamins and Antioxidants:**

Vitamin C: It is a water-soluble antioxidant that helps in the production of collagen and fights free radicals, which increases elasticity and firmness.

Vitamin E: A lipid-soluble antioxidant that fights against oxidative problems in different cell membranes. Beta-carotene or vitamin A, promotes cell rejuvenation and guards against oxidative problems which are brought about by UV radiation.

- **Protection by Enzymes:** They contain natural antioxidant defenses that shield skin cells from ROS, such as glutathione peroxidase and superoxide dismutase (SOD).

- **Inflammatory Reduction:** Aloe vera also protects the skin from long-term problems by inhibiting processes like LOX and COX, which reduces inflammation caused due to oxidative stress.

This herbal face gel has been formulated and stored in such a way that it maximizes the result that it is intended to show. Here an airless pump system has been used for storage of the gel. This not only ensures that it has spill proof packaging but also exhibits more features like:

- User friendly
- Easiness to carry
- Less product wastage
- Contents not being open to environmental pollutions

The face gels are most commonly seen in jars, but it makes the application difficult since you have to dip your fingers into a jar and it also increase chances of contamination in the formulation. But for this product you can precisely dispense only the needed amount of product using pump system

making it an innovative product as well.

This herbal face gel is recommended to be stored in room temperature preferably away from sunlight.

INGREDIENT PROFILE

LIQUORICE



Liquorice

Biological name: ***Glycyrrhiza glabra***

Family: Fabaceae

Chemical constituents: Glycyrrhizin, glabridin, liquiritin, flavanoids, licochalcon A, coumarins, polysaccharides, tannins.

Liquorice is the popular name for *Glycyrrhiza glabra*, a flowering plant that belongs to the Fabaceae family of beans and whose root is used to extract a sweet, aromatic flavoring. One of the oldest and most widely used herbal medicines in the world, liquorice has been incorporated into traditional herbal medicine in many cultures due to the beneficial properties of its bioactive components. For instance, about 60% of prescriptions for traditional Chinese medicine list liquorice as an effective treatment for bronchitis, asthma, fatigue, dry cough, phlegm and toxicity. The other constituents found in liquorice are amino acids, proteins, simple sugars, polysaccharides, mineral salts, pectin, starches, sterols, gums and resins.

One of the primary ingredients in liquorice extract is glycyrrhizin. It is regarded as a component that has the ability to suppress free radicals and a number of lipid peroxidation events. Glycyrrhizin shown efficacy as an antioxidant in an animal research. Other active ingredients in liquorice extract have also been shown in vitro to both promote and inhibit melanogenesis. The primary constituent of the hydrophobic fraction of liquorice extract, glabridin, inhibits the activity of the tyrosinase enzyme in B16 melanoma murine cell culture without influencing DNA synthesis. The tyrosinase enzyme is inhibited by additional active substances that were separated from liquorice extract,

including glabrene, isoliquiritigen liciraside, isoliquiritin, etc. Tyrosinase is unaffected by liquorice's flavanoids, including liquoritic acid. On the other hand, this substance depigmentates the skin by distributing melanin.

The potential skin benefits of liquorice are given below;

- **Skin Brightening:** Liquorice contains glabridin, which can treat uneven skin tone and pigmentation. Licorice also reduces melanin production which can help even out the skin tone.
- **Anti-inflammatory:** Liquorice extract contains liquiritin, which can help reduce redness and inflammation. This can be especially helpful for sensitive or irritated skin.
- **Antioxidant:** Antioxidants found in liquorice can shield the skin from pollutants and environmental harm.
- **Balances oil production:** Liquorice has mild astringent properties that can help calm these conditions.
- **Mimics retinol:** Liquorice can mimic the effects of retinol without the side effects.
- **Lightening serum:** Liquorice extract and kojic acid can be combined to create a lightening serum.

WHEAT GERM OIL



Wheat germ oil

Biological name: *Triticum aestivum*

Family: **Poaceae**

Chemical constituents: Vitamins, fatty acids, minerals, proteins, lecithin.

Wheat, or *Triticum aestivum*, is a widely used culinary commodity that is made up of around 80% endosperm, 15% bran, and 5% germ. According to reports, the embryo is a good source of tocopherols, carotenoids, polyphenols, and antioxidants. Wheat germ has been added to meals and food items because it is thought to be very healthy. About 10% of the wheat endosperm contains

oil and the wheat germ is ground to generate wheat germ oil. Both the food and cosmetics industries make extensive use of wheat germ oil. According to reports, wheat germ oil's protein content is a rich source of amino acids including methionine, threonine and lysine, and it is thought to have therapeutic benefit.

Because of its strong nutritional profile and vitamin E enrichment, wheat germ oil is a specialty oil. Wheat germ oil processes a significant amount of policosanols, polysterols, tocopherols, carotenoids, thiamine, riboflavin, glutathione etc and numerous enzymes. Depending on the type, extraction technique and purity, wheat germ can have an oil level of 10–15%.

The cosmetic benefits of the various components of wheat germ oil include:

Vitamins: Vitamin E is a strong antioxidant that helps to repair and moisturize the skin while lowering oxidative stress and preventing aging. Vitamin A promotes cell turnover, improve texture and reduces wrinkles. It also fades pigmentation and evens out skin tone. Vitamin D strengthens the skin barrier and maintain hydration. It also soothes sensitive or irritated skin.

- **Essential fatty acids:** It includes Linoleic acid and oleic acid. It repairs the skin's natural barrier, preventing water loss, soothes inflammation and reduces acne related redness.
- **Proteins and amino acids:** Boosts collagen production for firmer, more youthful skin. It strengthens hair follicles and repairs damages strands.
- **Lecithin:** Acts as an emollient, softening and smoothening the skin and hair. It enhances moisture retention, improves the delivery and absorption of active ingredients.
- **Minerals:** Zinc repairs skin, reduces acne and controls oil production. Magnesium calms sensitive skin and reduces redness. Phosphorous supports cell metabolism and rejuvenation.

Wheat germ oil has many cosmetic benefits including;

- **Moisturizing:** Wheat germ oil is a great emollient that keeps skin soft and supple. It contains fatty acids, vitamin A, D and B, which help moisturize and heal dry or cracked skin.
- **Anti-aging:** Antioxidants included in wheat germ oil shield the skin from free radicals, which can cause premature aging. Additionally, it helps avoid wrinkles.
- **Even skin tone:** Vitamins A and D in wheat germ oil help fade dark spots and blemishes and even out skin tone.
- **Production of collagen:** Wheat germ oil's fatty acids aid in the synthesis of collagen, which gives skin a firmer texture.
- **Skin regeneration:** Wheat germ oil contains vitamins B and E, which aid in the healing of damaged skin and encourage the growth of new skin.
- **Sunscreen:** Wheat germ oil contains antioxidants that can help prevent tanning.

Note : WHEAT GERM OIL was obtained from Dravida organics, Delhi.

ALOE VERA



Aloe vera

Botanical name: *Aloe barbadensis miller*

Family: **Liliaceae**

Chemical constituents: Vitamins, polysaccharides, glycoproteins, enzymes, amino acids, minerals, salicylic acid, lignin.

Aloe barbadensis miller, the scientific name for aloe vera, is a succulent plant that is a member of the Liliaceae family. This perennial plant, which is well-known for its therapeutic and beauty qualities, has thick, fleshy leaves with a clear gel inside. The leaves can grow up to 24-36 inches in length and the outer portion of the leaves contain a yellow sap called latex. Aloe vera produces tubular yellow flowers that grow on spikes from the center of the plant, which appears mostly in summer. Although aloe vera is currently grown all over the world, it is thought to have originated in the Arabian Peninsula. It is commonly found in places like Africa, India, Mexico and the Caribbean.

For millennia, aloe vera has been utilized in traditional medicinal and cosmetic procedures. Various chemical constituents contained in aloe vera which are of cosmetic importance are enlisted below;

- **Vitamins:** Vitamins A, C, and E are abundant in aloe vera. These are potent antioxidants that can support skin health and shield the skin from harm caused by free radicals.
- **Polysaccharides:** Aloe vera contains complex carbohydrates, which form a protective layer on the skin, preventing moisture loss and enhancing hydration. These polysaccharides also stimulate fibroblast activity to repair damaged skin.
- **Enzymes:** Enzymes like bradykinase reduces swelling and redness. It also helps to remove dead skin cells.
- **Amino acids:** They retain moisture in the skin, keeping it soft and supple. It also aids in regeneration of damaged tissue.
- **Minerals:** Zinc regulates oil production and supports skin healing. Magnesium and calcium protect against oxidative stress.

- **Anthraquinone:** Eg; Aloin. Aloin helps lighten hyperpigmentation and dark spots. Prevents acne by reducing bacterial growth on the skin.
- **Saponins:** These are natural surfactants that cleanse the skin and removes impurities. It also reduces the risk of infections and acne breakout.
- **Lignin:** Enhances penetration thereby helps aloe vera's active ingredients to penetrate deeper into the skin.
- **Salicylic acid:** Exfoliates pores and reduces inflammation, preventing breakouts.
- **Sterols:** Calms irritated skin and reduces puffiness, reinforces the skin barrier to lock in moisture.

Incorporation of aloe vera in cosmetic products provide a wide range of benefits, from hydration and soothing to anti-aging and anti-microbial effects, making it a versatile and valuable ingredient in skin care.

The cosmetic benefits of Aloe vera include:

- **Moisturizing:** High water content of aloe vera help hydrate skin without leaving a greasy feel, making it an excellent moisturizer suitable for all skin types.
- **Soothing and healing:** Aloe vera can alleviate skin irritation, sunburn and minor cuts. It provides instant relief from burns and insect bites by imparting a cooling effect.
- **Anti-inflammatory:** Anti-inflammatory compounds present in aloe vera reduce swelling and are beneficial for conditions like acne, eczema, and psoriasis.
- **Anti-aging:** The potent antioxidants beta-carotene, vitamin C and vitamin E found in aloe vera can enhance the skin's natural firmness and hydration, which will lessen the visibility of fine lines and wrinkles.
- **Anti-microbial:** Aloe vera helps in treating acne and preventing bacterial infections due to its anti-microbial property. It can also reduce occurrence of breakouts and pimples.
- **Exfoliation:** The natural enzymes present in aloe vera gently exfoliate the skin, help in removing dead skin cells and promote the regeneration of new cells, resulting in a more radiant complexion.

MATERIALS AND METHODS

List of materials used in the present work

SL NO	MATERIALS USED
1.	Liquorice
2.	Wheat germ oil
3.	Aloe vera
4.	Carbapol 940
5.	Glycerine
6.	Sodium benzoate
7.	Tartaric Acid
8.	NaOH
9.	Tween 80
10.	Gerenium Essential Oil
11.	Distilled Water
12.	Phosphate buffer solution
13.	1% Pottasium ferricyanide solution
14.	10% Trichloro acetic acid
15.	Ferric chloride
16.	Deionized water

METHODOLOGY:

PREPARATION OF EXTRACTS

ALOE VERA EXUDATE

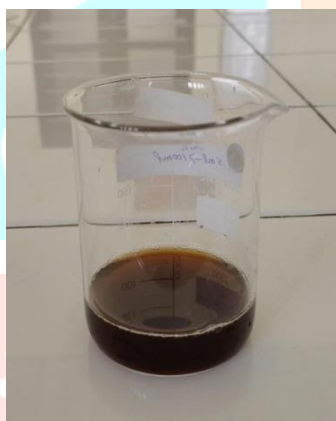
- Aloe vera leaves were cleaned with water, they were sliced into pieces using a knife in a transverse direction.
- The central parenchymatous pulp was scooped out with a spatula from the aloe leaves.
- The pulp was then placed in a blender to obtain the juice.
- The obtained juice was subjected to filtration to get clear liquid.
- The prepared exudate was kept in a refrigerator in a properly sealed jar.



Aloe vera exudate

LIQUORICE EXTRACT

- Accurately weigh 10g of liquorice root powder.
- It was then mixed with 100ml of distilled water.
- For 20 to 30 minutes, the mixture was left to steep, occasionally stirring.
- A water bath maintained at 40-50 degree celsius was used for steeping to extract the active compounds.
- After steeping, the extract was filtered using a muslin cloth or whatman filter paper to remove solid residues.
- Sodium benzoate was added as preservative to the extract to prevent microbial growth in the aqueous extract and extend its shelf life.
- The prepared extract was kept in the refrigerator in a carefully sealed amber- coloured jar.



Liquorice extract

FORMULATION OF FACE GEL

- Carbapol 940 was weighed and then dissolved in 10ml purified water. A magnetic stirrer was used to mix the solution in order to prevent lumps and guarantee even dispersion.
- Allow the mixture to hydrate for 30min to form the gel.
- Glycerin (humectant) and Tween 80 (emulsifier) was added to the hydrated carbapol. The mixture was stirred continuously to form a homogenous gel.
- In a separate container, liquorice extract, aloe vera exudate and wheat germ oil was mixed thoroughly to form the API mixture.
- After the gel base was ready, the prepared API combination was gradually added and well mixed until it was homogeneous.
- Other ingredients and preservatives like sodium benzoate and tartaric acid were added to the mixture with stirring until uniformly distributed.
- Few drops of perfume (geranium essential oil) were added to the final mixture.
- To reach the required final volume of the formulation, distilled water was added.
- NaOH was added drop wise to adjust the pH of the final formulation.



Prepared face gel

Working formula of three formulations

Composition of gel formulations	F1	F2	F3
Liquorice	0.7 ml	0.7 ml	0.7 ml
Wheat germ oil	1.5 ml	1.2 ml	1.9 ml
Aloe Vera	3.2 ml	2.81 ml	5 ml

Carbapol 940	0.18 g	0.18 g	0.18 g
Glycerine	1.2 ml	1.2 ml	1.2 ml
Sodium benzoate	0.09 g	0.09 g	0.09 g
Tartaric Acid	0.03 g	0.03 g	0.03 g
Tween 80	0.15 ml	0.15 ml	0.15 ml
Gerenium Essential oil	0.06 ml	0.06 ml	0.06 ml
Distilled Water	qs	qs	qs
NaOH	qs	Qs	qs

Qs: quantity sufficient

EVALUATION OF GEL FORMULATION

- **Organoleptic properties:** All prepared formulations were evaluated for its organoleptic properties for its colour, odour and texture.
- **Homogeneity and transparency:** Homogeneity assessment of all the prepared formulations of face gel was done. The gel was examined by pouring it in a container and observing it against a white and black background to obtain colour, gel appearance and the presence of any visible clusters.
- **Spreadability:** The spreadability of the prepared formulation was evaluated. A second glass plate was set on top of a glass plate with 1g of the gel preparation enclosed in a circle with a diameter of 1 cm. The gel's diameter was measured after an additional 100g of weight was left on the topmost glass slide for five minutes.

Spreadability can be determined with the formula: $S = d^2 \times \pi / 4$

Where, S= spreadability area depending on mass (mm²) d= spreading area diameter (mm)

- **Irritancy test:** The developed gel mix was rubbed onto the exterior portion of the left hand and tested for irritation, eczema and various rashes within 24 hours of application.
- **Viscosity:** The Brookfield viscometer was used to measure the formulation's viscosity and the results were found in poise.

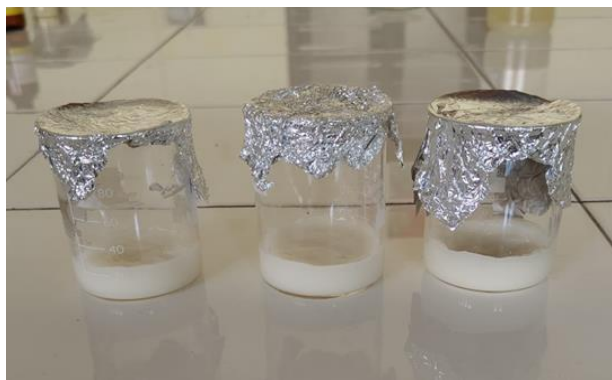
- **pH measurement:** A buffer solution with pH values of 4 and 7 was used to calibrate the digital pH meter. Accurately weighed 0.5g of face gel was dissolved in 50ml of distilled water, pH was measured after 2 hours.
- **Stability test:** After considering the above parameters one formulation was selected as the best formulation and stability studies were conducted on this formulation. Stability studies of the formulation was studied for a period of time by keeping it in a temperature of 25 to 30°C.
- **Anti-oxidant activity(FRAP assay):** Take 2ml of face gel in a test tube. Then add 2.5ml phosphate buffer solution. Thoroughly mix the contents in the test tube. Then 2.5ml of 1% potassium ferricyanide solution is added to it. After this the reaction mixture is vortexed well using a vortex shaker. After that, the entire thing is left to stand for about 20 minutes at 50°C. Then 2.5 ml of 10% trichloroacetic acid is introduced into the mixture when the incubation period is over. The test tubes are centrifuged at 3000 rpm for 10 minutes. From this centrifuged sample, 2.5ml of supernatant was taken into a test tube. Then to this new separate test tube having 2.5ml supernatant, we add 2.5ml demonized water. After this, 5ml ferric chloride was added to the new test tube.

RESULTS AND DISCUSSION

1. Organoleptic properties

Parameter	F1	F2	F3
Colour	Off white	Off White	Pale yellow
Odour	Pleasant	Pleasant	Pleasant
Consistency	Good	Very Good	Thin
Texture	Smooth	Smooth	Smooth

Organoleptic properties of gel



Formulations F1 to F3

2. Homogeneity

Parameter	F1	F2	F3
Homogeneity	Good	Very Good	Moderate

Homogeneity of the gel

3. Spreadability test



Spreadability testing

Parameter	F1	F2	F3
Spreadability(mm ²)	3957.1	3846.5	4183.2

Spreadability of the gel

4. Irritancy test

Parameter	F1	F2	F3
Irritancy	Nil	Nil	Nil

Irritancy of gel

5. Viscosity

Parameter	F1	F2	F3
Viscosity	21poise	24poise	19poise

Viscosity of gel

6. pH of the gel

Parameter	F1	F2	F3
pH	6.24	5.91	5.78

pH of the formulations

pH of the optimized formulation



Formulations F1, F2 and F3 were tested using various evaluation parameters. The properties of F2 was found to be very good compared to F1 and F3.

7. Stability studies

The stability studies were performed on formulation F2. The stability studies were performed during the storage period of the formulation that is for a period of 4 weeks and given below are the observations.

Stability test parameter	F2
Physical appearance	Off white
Spreadability	3846.5
pH	5.91
Viscosity	Viscous

Stability studies

8. **Anti-oxidant Activity (FRAP assay):** Antioxidant activity of prepared formulation was performed by using FRAP assay. In this assay, resulting formulation was appeared as blue colour due to the conversation of ferric to ferrous ion. Blue colour indicates the existence of antioxidant activity.



FRAP Assay

SUMMARY AND CONCLUSION

- Aim of the current project has been to formulate and evaluate a herbal face gel with anti-aging, anti- hyperpigmentation, and moisturizing properties.
- Wheat germ oil, licorice extract and aloe vera extract were used as active ingredients and these substances were picked because of their very well-known skin advantages.
- The concentration of the compounds was changed to create three formulations (F1, F2 and F3). Formulation F2 met all the needed requirements making it the perfect topical gel.
- The formulations were evaluated using a variety of methods, including FRAP assay to detect antioxidant activity, pH measurement, homogeneity, viscosity and physical appearance.
- The evaluation study's results were considered satisfactory. The formulation exhibited good antioxidant activity and satisfied all the requirements for a topical gel, including the ideal pH and viscosity.
- Thus this gel formulation can be used topically for reducing hyperpigmentation, increasing skin elasticity and antioxidant property helps with sun damage and premature skin aging.

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