

Formulation, Development and Evaluation of Anti-Aging Herbal Cream

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Abstract

According to studies, continuous deterioration process is the result of skin aging because of protein & cellular DNA damage. The main purpose of this work is to formulate an anti-aging herbal cream by using natural ingredients. The natural ingredients are pomegranate, curcuma longa, amla, hibiscus, green tea, vitamin E, coconut oil, olive oil, aloe vera, basil oil, mint oil. Oil based cream is formulated using natural ingredient. The creams were created in various concentrations, ranging from F1 to F4. During stability trials, the creams was stable according to ICH criteria. For 1 months, 30± 20C / 45±5 percent RH and 40±20C / 75±5% RH were used. It can be determined that multi-herbal creams are beneficial with multiple effects and excellent spreadability and minimal irritancy.

Keywords: Anti-ageing, Natural ingredients, Oil base cream, Multipurpose.

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Introduction

We all want to seem youthful and attractive, so we use a variety of cosmetics to tone up our skin and reduce pimples, acne, wrinkles, skin tan, blackheads, and other signs of aging. [1] The effect of skin ageing is a continuous degradation process caused by protein and cellular DNA damage. There are two forms of skin aging: (i) sequential skin aging and (ii) photoaging.

Because they change the skin's function and physiological features, sequential skin ageing is a universal and predictable process. Due to insufficient keratenocyte

synthesis in the skin layer, the stratum corneum delays the creation of neutral lipids in the ageing process, resulting in dry, pale skin and wrinkles. Photo aging, on the other hand, is caused by excessive UV exposure. Photoaging is characterised by dry, pale skin, shallow skin, fine wrinkles, and deep furrows, which are caused by a random mixture of dermal and epidermal portions, as well as elastosis and heliodermatitis.

We use cosmetics to protect skin from exogenous and endogenous toxins as well as to enhance the attractiveness and appeal

of skin. Cosmetics are used not only for development, but also to give us a pleasing external look and to treat a variety of skin conditions. Natural ingredients in skin formulations enhance the skin's health, texture, and moisture, as well as retain skin elasticity by lowering type I collagen and providing UV protection. Natural elements in cosmetic preparations assist in preventing the development of free radicals in the skin, allowing the skin to be protected for longer periods of time. The ideal choice for reducing skin issues such as ageing, wrinkles, hyper pigmentation, rough skin texture, acne, and skin tan is to use cosmetic products with natural ingredients.

There are many synthetic cosmetic products that are similarly effective, but their various negative effects have caused people to be concerned about their health, thus the demand for herbal cosmetics is fast increasing. [2]

Materials and Methods:

Preparation of Aloe vera extract

Leaf of Aloe vera was weighed after being rinsed with tap water. This one was important not to rip the rind because exudates of aloe vera leaves may contaminate the fillet. Aloe leaves were processed using traditional hand method of filleting. Sharp blades are used to remove the lower part of leaf base, the tapering tip at the leafy top, and the small spines along the leaf border. The blade was then placed beneath the green rind in the mucilage layer, eliminating the vascular bundles, as well as the top rind was removed. The clear, dense mucilaginous gel was cut into pieces after the aloe vera leaf skin was scraped off & parenchymatous tissue was gathered. The resulting gel was crushed and

lyophilized. Then the powder of lyophilized gel is placed into soxhlet apparatus and extracted for four hours at 90°C with 90 percent ethanol. The extract-containing ethanol is screened and concentrated using a rotary evaporator before being stored at 90°C temperature.[3]

Preparation of Curcuma longa extract

Turmeric rhizomes were gathered and cleansed adequately as part of this process. After that, the drying & grinding were completed. Drying and size reduction are required for processing because size affects its migration of bioactive substances from source into solvent (the smaller the size, the greater the migration of bioactive components from origin to solvent). Extraction and Purification: After that, the ground samples go through an extraction process. Because of its minimal operational cost and ease of handling, the conventional technique is the most widely used method for extracting curcumin. The reflux technique of turmeric powder with dichloromethane yielded greater extraction efficiency ranging from 81.81 to 86.36 % across the different extraction procedures. However, when compared to other current extraction procedures, the sub-critical water extraction technique boosts extraction efficiency to 76 percent as a green extraction technology. Identification and measurement: HPLC with a column C18 of various length (100–250 mm), inner lengths (2.1–4.6 mm), & particle diameter (0.45–5m) was the most accurate approach utilised to characterise curcumin. HPLC is a sophisticated liquid chromatography technology with a maximum separation capacity. The samples were also scanned in a variety of modalities. The key approach for identifying the bioactive chemicals was comparing the measured MS/MS spectra.

The formulation studies were carried out according to the formula in table. The formulation containing as Azadiracta indica, Curcuma longa, pomegranate, Aloe vera, Vitamin E, Amla Oil, Green Tea oil, Coconut Oil, Hibiscus oil, Olive oil, Tulsi oil, Mint oil

- Heat beeswax in a borosilicate glass beaker at 70°C and maintain that heating temperature.
- Add other ingredients one by one with continuous stirring.
- Add mint oil just before filling of formulation in a suitable container.
- Then after mix mint oil fill the formulation in a container and allow it to cool.

Herbal Ingredients Used In Anti-Aging Face Care

1. Hibiscus: [4-6]

Botanical Name – Hibiscus rosa

Family – Malvaceae

Chemical Constituents – Tannins, Anthraquinones, Quinines, Phenols, Flavanoides, Alkaloids, Terpenoids, Saponins, Cardiac glycosides, Protein, free amino acids, Carbohydrates, Reducing sugars, Mucilage, Essential oils and steroids.

Uses - Anti-aging, Wound healing,

2. Curcuma longa: [7-11]

Botanical Name – Curcuma longa

Family – Zingiberaceae

Chemical Constituents – Curcumin, Carbohydrates, Essential Oil, Demethoxycurcumin, fats, dietary fibers, proteins, bisdemethoxycurcumin

Uses - Heal wounds, Brighten dark circle, Treat inflammation, Treats eczema & psoriasis, Reduce acne scarring

3. Green tea: [12]

Botanical Name – Camellia Sinensis

Family – Theales

Chemical Constituents – Vit. (B, C & E) , Enzymes & peptides, Glucose, sucrose, fructose, pectin and cellulose, Caffeine, Theophylline, Chlorophyll, Carotenoids.

Uses - Catechins help in anti-aging, Prevent skin redness

4. Amla: [13-15]

Botanical Name – Phyllanthus embilca

Family – Euphorbiaceae

Chemical Constituents – tannins, alkaloids, phenols, proteins, fats, calcium, nicotinic acid, fibres, iron, mineral matter, phosphorous, vitamin C, carbohydrate.

Uses - anti-inflammatory, free radicals .

5. Olive Oil: [16-18]

Botanical Name – E. Oleaster

Family – Oleaceae

Chemical Constituents – Triglycerides, Di and mono glycerides, hydrocarbons, Pigments, sterols, polyphenols, tocopherols, volatile compounds, triterpene acid.

Uses - anti-aging antioxidant, healing of injured skin tissues, It revitalises and enhances the tonicity of the skin, It help to remove sun tan.

6. Vitamin : [19-22]

Vitamin E is obtain mainly from plant, so dietary source are the important source through which we receive vitamin E. Nuts, whole grains spinach, sunflower oil, and olive oil are the best sources.

IUPAC Name - (2R)-2,5,7,8-Tetramethyl-2-[(4R,8R)-4,8,12-trimethyltridecyl]-3,4-dihydrochromen-6-ol

Mol. Formula - C₂₉H₅₀O₂

Mol. Weight - 430.7 g mol⁻¹

Uses - Wrinkles and fine lines are prevented, Used for moisturizing skin, It protects from sunburn, Act in wound healing, Useful in skin cancer prevention, Relieve itchiness on the dry skin, It also treats eczema and psoriasis

7. Piper Mint: [23-24]

Family: Labiatae

Botanical Name: Menthapipertia L

Chemical constituents: Menthol, Menthone, Menthyl acetate, Menthofuran, 1,8-cineol, Limonene, Pilegone, Caryophyllene, Pinene, Eriocitrin, Hesperidin

Uses: It reduces pimples, cools skin and scalp, stimulates blood flow, regulates sebum and anti-inflammatory effect.

8. Pomegranate: [25-27]

Family: Lythraceae

Botanical name: Punica Granatum

Chemical Constituents: Anthocyanins, Quercetin, Gallic acid, Asistic acid, Rutin, Punicicacid, Flavones, Punicalin.

Uses: It has anti-aging properties, improve skin tone, calming effect on the skin, It is great for sun bunnies, provide a fresh and revitalized appearance, It moisturize the skin.

9. Aloe Vera: [27]

Family: Liliaceae

Botanical Name: Aloe barbadensis miller

Chemical Constituents & Active Components: Vitamins – Vit-A,C,E,B1,

B2,B6 and B12, Enzymes – Aliiase, amylase, oxidase, catalase, lipase, Minerals – Calcium, copper, potassium selenium, chromium, Sugars – Glucose, polymannose, alprogen,, Organic Acids – salicylic acid sorbate, Anthraquinones - Aloin, anthranol, emodin. Fatty acids & Steroids – Beta-sisosterol, Lupeol, cholesterol, Non-essential aminoacids – Arginine, glycine, alanine, Essential aminoacids – Methionine, leucine, lysine, Hormones –Auxins, Gibberellin. Uses: Anti-aging, Anti-fungal, Anti-oxidant, Wound healing, Anti-inflammatory, moisturize the skin.

10. Coconut Oil: [28]

Family: Arecaceae

Botanical Name: Cocosnucifera (L.)

Chemical Constituents: Saturated fats ; Lauric acid (45% to 52%), Myristic acid (16% to 21%), Palmitic acid (7% to 10%), Caprylic acid (5% to 10%), Capric acid (4% to 8%), Stearic acid (2% to 4%), Caproic acid (0.5% to 1%), Palmitoleic acid (in traces)

Unsaturated fats:Oleic acid (5% to 8%), Linoleic acid (1% to 3%), Linolenic acid (up to 0.2%)

Uses: Wound healing, Antioxidant, Dermatitis, Anti-fungal, Anti inflammatory

11. Tulsi: [29-30]

Family: Lamiaceae

Botanical Name: Ocimum sanctum

Chemical Constituents & Active Components: Eugenol, methyl eugenol, carvacrol, sesquiterpine hydrocarbon caryophyllene, cirsilineol, rosameric acid, isothymusin, curcimaritin, apigenin.

Uses: Act against aging, Cleanses the skin thoroughly, Used as acne treatment, Helps in lightning is skin tone, Antiviral, antifungal, antibacterial, antitubercular, and antimalarial activities are all present in it.

Optimization of Base formulation

Physical evaluation of preparation

The formulae were visually assessed for appearance, consistency, colour, and odour of each base formulation. Consider as + Poor, ++ Good, +++ Better to select the most stable base formulation.

Abbreviation: Poor = +, Good = ++, Better = +++

S.N	Parameter	F1	F2	F3	F4
1	Appearance	++	+	++	+++
2	Consistency	++	++	+++	+++
3	Odour	++	+	++	++

Discussion: Based on the preceding table, it was observed that the formulation F4 has no changes in color, consistency, or odour.

Determination of pH

Apperatus include a beaker, a pH metre, a stirrer, and a wash bottle.

Procedure: A standard buffer sol was used to calibrate the pH metre. The pH of the cream was determined at 27°C after 0.5 g of the cream was measured and mixed in 50 ml distilled water. A standard buffer sol was used to

Parame ter	Formulation			
	F1	F2	F3	F4
Thermal Stability	Oil not Seperate	Oil not Separate	Oil not Separate	Oil not Separate

calibrate the pH metre. The pH of the cream was determined at 27°C after 0.5 g of the cream was measured and mixed in 50 ml of distil water.

S.No	Days	Formulation			
		F1	F2	F3	F4
1	Initial Days	6.0	6.2	6.5	6.5
2	7 days	6.1	6.3	6.3	6.5
3	15 Days	6.3	6.4	6.0	6.4
4	21 Days	6.2	6.5	6.5	6.5
5	30 Days	6.4	6.3	6.4	6.4

Discussion: Based on the findings, the formulations F1, F2, F3, F4, and all others have the necessary pH. (The desired pH should be lies between 5.5 to 7.5)

Determination of viscosity

Brookfield viscometer, beaker, thermometer, and wash bottle are some of the apparatus used.

Procedure: A 100 gm sample of each formula was weighed and transferred to a beaker, where the viscosity of the formulation was evaluated using a Brookfield Viscometer (DV II+ Pro model) with spindle number S64 at 20 rpm at 25°C.

S. N	Days	Formulation			
		F1	F2	F3	F4
1	Initial Days	21650 cps	22790 cps	2376 0 cps	2548 0 cps
2	7 days	23415 cps	25340 cps	2547 0 cps	2714 0 cps
3	15 Days	24488 cps	27255 cps	2738 3 cps	2700 5 cps
4	21 Days	25683 cps	28160 cps	2826 0 cps	2611 5 cps
5	30 Days	25390 cps	29280 cps	2934 0 cps	2722 0 cps

Discussion: Based on the foregoing findings, F4 had the most stable and adequate viscosity among the three formulations tested: F1, F2, and F3.

Spreadability test

Parameter	Formulation			
	F1	F2	F3	F4
Spreadability	25.23 ± 0.5	23.37 ± 0.5	22.15 ± 0.5	21.93 ± 0.5

Discussion Based on the findings, the formulation BF4 had better Spreadability over BF1, BF2, and BF3.

Determination of Thermal Stability

Discussion: As seen above, the formulations F1, F3, and F4 showed no oil separation, however F2 did.

Stability study

Formulation	Physical Characteristic		
	Color	Sudden Viscosity Change	Feel
Initial Days			
F1	White	No Change	Smooth
F2	White	Change	Smooth
F3	White	No Change	Smooth
F4	White	No Change	Smooth

After 1 week			
F1	White	No Change	Tacki
F2	White	Change	Smooth
F3	White	No Change	Smooth
F4	White	No Change	Smooth
After 2 weeks			
F1	White	No Change	Tacki
F2	White	Change	Smooth
F3	White	No Change	Tacki
F4	White	No Change	Smooth
After 3 weeks			
F1	White	No Change	Tacki
F2	White	Change	Smooth
F3	White	No Change	Smooth
F4	White	No Change	Smooth

The formulation F4 is stable at room temperature, based on the above observation. The feel of the F1, F2, and BF3 formulations differed.

Based on the following findings, it was discovered that Batch No. F4 of cream base complies with all of the specifications set per the Indian standard for cream. As a result, the trial number F4 is chosen as the foundation for subsequent research.

Evaluation of Anti-aging herbal skin cream

a) Physical evaluation of the formulation :

The compositions were visually assessed for colour, appearance, and odour.

b) Measurement of pH :

A pH metre was used to monitor the pH, which was calibrated with standardized buffer solutions of pH 4, 7, and 9 before each usage. At room temperature, the electrode was put in sample 10 minutes before the measurement was taken.

c) Viscosity

A Brookfield Viscometer was used to test the viscosity of the compositions (DV-I PRIME, USA). The gels were spun at three different speeds: 0.3, 0.6, and 1.5 revolutions per minute. The gel's viscosity was calculated by multiplying the matching dial reading by the factor specified inside the Brookfield Viscometer handbook.

d) Spreadability

When two slides are placed in between them then under direction of a given force, the time it takes for them to slip off the gel is measured in seconds. The extra sample was put between both the two glass slides, and a certain amount of load was applied to these glass slides in order to compress them to a consistent thickness. A 70-gram weight was added, and the time it took to distinguish two slides was recorded. The formula for calculating spreadability was used.

$$S = M.L / T$$

where M is the weight attached to the top slide, L is the length of the glass slides, and T is the time it took to split the slides.

e) Stability

Drug product stability testing begins with drug discovery and concludes with the destruction of the chemical or commercial product. Stability studies were carried out in accordance with ICH recommendations to test the drug & formulation stability. The stability tests were performed in accordance with ICH recommendations. The cream was placed in a bottle and stored in a humidity chamber for three months at a temperature of 40 °C and a relative humidity of 75 %. Samples were evaluated for physical characteristics, pH, and viscosity at the conclusion of the investigations.

f) Acid value

Take 10 gm of material, accurately weighed, and dissolve it in a 50 ml mixture of equal parts alcohol and solvent ether. Connect the flask to a reflux condenser & slowly heat until the sample is completely dissolved. Add 1 ml of phenolphthalein and titrate with 0.1N NaOH until a faint pink colour appears after 30 seconds of shaking.

$$n \times 5.61/w = \text{acid value}$$

$$n = \text{amount of ml of NaOH necessary}$$

The weight of the material is denoted by the letter w.

g) Saponification value

Introduce roughly 2 gm of material, refluxed for 30 minutes by 25 ml of 0.5 N alc KOH, 1 ml of phenolphthalein, and titrated with 0.5 N HCL immediately.

Saponification value = $(b-a) \times 28.05/w$ The volume in ml of titrant = a

The volume in ml of titrate = b

The weight of substance in gm = w

h) Irritancy test

Here on left hand dorsal side, draw a 1sq.cm area. The cream subsequently applied to the designated region, and the duration was recorded. Irritation, erythema, and edoema were assessed and reported at periodic intervals till 24 hours.

i) Microbial growth test

By streak plate technique, the designed cream was inoculated on Muller Hinton agar media plates, and a control was made by removing the cream. The specimens were kept in the incubator and incubated overnight at 37 degrees Celsius. Just after incubation period, the plates were removed and compared to the control to determine microbial growth.

Result and Discussion

Determination of pH:

Sr No	Days	Formulation			
		F1	F2	F3	F4
1	Initial Days	6.0	6.2	6.5	6.5
2	7 days	6.1	6.3	6.3	6.5
3	15 Days	6.3	6.4	6.0	6.4
4	21 Days	6.2	6.5	6.5	6.5
5	30 Days	6.4	6.3	6.4	6.4

Discussion: For 30 days, the pH test was carried out on the base formulation. The cream's pH was discovered to be between 5.6 and 6.8, which is ideal for skin pH. All of the cream formulations had a pH that was closer to what the skin requires, although the pH of formulations F1, F2, and F3 varied over time. The pH of Formulation F4 is steady.

Determination of Viscosity:

S. No	Days	Formulation			
		F1	F2	F3	F4
1	Initial Days	21650 cps	22790 cps	23760 cps	25480 cps
2	7 days	23415 cps	25340 cps	25470 cps	27140 cps
3	15 Days	24488 cps	27255 cps	27383 cps	27005 cps
4	21 Days	25683 cps	28160 cps	28260 cps	26115 cps
5	30 Days	25390 cps	29280 cps	29340 cps	27220 cps

1	Initial Days	21650 cps	22790 cps	23760 cps	25480 cps
2	7 days	23415 cps	25340 cps	25470 cps	27140 cps
3	15 Days	24488 cps	27255 cps	27383 cps	27005 cps
4	21 Days	25683 cps	28160 cps	28260 cps	26115 cps
5	30 Days	25390 cps	29280 cps	29340 cps	27220 cps

Discussion: For the Active Base Formulation, a 30-day viscosity test was conducted. Formulations F1, F2, and F3 had marginally greater viscosity than F4 due to the active content, whereas F4 had a cream-like consistency.

Acid Value and saponification value

	F1	F2	F3	F4
Acid Value	6.3	5.4	5.5	6.1
Saponification	27.0	27.5	26.8	26.2

Discussion: Based on the results, the formulations F1, F3, and F4 have the desired acid and saponification values.

Irritancy test

Formulation	Irritant Effect	erythema	Edema
F1	No	No	No
F2	No	No	No
F3	No	No	No
F4	No	No	No

Discussion: During irritancy trials, all formulations demonstrate no redness, edoema, inflammation, or irritation. These products are safe to use on the skin.

Accelerated stability testing

S. No	Evaluation Parameter	F4	F4
		Room Temperature	Accelerated condition(45°C)
1	Appearance	Excellent	Excellent
2	Color	Light Brown	Light Brown
3	pH	6.4	6.7
4	Consistency	Soft and Semisolid	Soft and Semisolid
5	Viscosity	25880 cps	25915 cps
6	Spreadability	Good	Good
7	Washability	Good	Good
8	Irritancy Test	Irritation was not observed	Irritation was not observed

Discussion: Based on the results, the F4 formulation is stable at room temperature and at accelerated conditions.

Spreadability test

Parameter	Formulation			
	F1	F2	F3	F4
Spreadability	25.23 ± 0.5	23.37 ± 0.5	22.15 ± 0.5	21.93 ± 0.5

Discussion: Based on the results, the formulations F3 and F4 have good spreadability.

Microbial growth test

Discussion: After a 24-hour incubation period at 37°C, there were no indicators of microbial development, which was comparable to the control.

DISCUSSION

Azadiracta indica, Curcuma longa, pomegranate, Aloe vera, Vitamin E, Amla Oil, Green Tea Oil, Coconut Oil, Hibiscus oil, Olive oil, Tulsi oil, Mint oil are widely recognised in Indian traditional medicine and ayurvedic preparation for their therapeutic properties.

Because the poly-herbal anti-aging herbal face cream is an oil-based product, it can readily penetrate the skin's dermal layer and provide superior action, resulting in higher customer satisfaction.. Herbal cosmetics are in high demand on the global market, and they are a priceless natural gift. As a result, we attempted to create a polyherbal face cream with extracts of Azadiracta indica, Curcuma longa, pomegranate, Aloe vera, Vitamin E, Amla Oil, Green Tea Oil, Coconut Oil, Hibiscus oil, Olive oil, Tulsi oil, and Mint oil in various concentrations. According to our findings, the formulation F4 was determined to be more stable, but the remaining formulations were not stable as compare to F4

The F4 formulation had a nearly constant pH, was homogeneous, emollient, non-greasy, and removed readily after its action and application.

In terms of skin irritation and allergy sensitization, the stable formulations were unaffected. Green tea (*Camelia sinensis*) and pomegranate (*Punica granatum*) extracts include a variety of beneficial antioxidants and

free radical neutralizers, such as ellagic acid, punicalagins, gallic acid, punicalins.

Vitamin E is included in these antioxidants, which is necessary for maintaining healthy skin and also repairing and calming irritated skin.

Aloesin, a bioactive molecule found in Aloe vera extract, has been reported. Furthermore, because of its antioxidant action, Aloe vera has been claimed to protect skin against ultra violet radiation damage.

Mucopolysaccharides included in aloe vera aid in the binding of moisture to the skin.

Aloe vera stimulates fibroblasts, which generate collagen and elastin fibres, make skin more supple and wrinkle-free.

Amla oil is anti-oxidant, brightening, softening, tightening pores, and firming.

Hibiscus oil has anti-aging properties, as well as blood purification, skin brightening, and collagen production. Tulsi oil contains antibacterial properties, adds radiance to the skin, and has a cooling and calming effect.

Mint oil has antiseptic, antimicrobial, and cooling properties, calms irritation and inflammation, and helps to keep collagen in place. Preservatives

Coconut oil demonstrates Flavoring agent, anti-itch, hydrating dry skin

Anti-inflammatory, antimicrobial, and antioxidant properties of Curcuma longa oil has been observed.

Conclusion

The developed formulation demonstrated good spreadability, there is no signs of phase breakdown, and high consistency during the period of study, according to the discussion above. It can be concluded from the preceding research that herbal extracts can be used to develop creams.

Punica granatum and Aloe Vera extracts had high antioxidant activity. The results of various cream testing revealed that the formulation may be utilised topically to preserve skin from harm and delay the ageing process. It is possible to create creams with natural extracts.

According to the observations, mixing the extracts of *Punica granatum* leaves & different components in varied ratios resulted in a multipurpose effect on skin, including whitening, antiwrinkle, antiaging, and sunscreen effects. As we all know, it is impossible to raise the efficacy of a single plant extract's medicinal and cosmetic properties, but it is possible to increase the efficacy of extracts by mixing diverse natural components.

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