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FORMULATION AND EVALUATION OF POLYHERBAL ANTI-AGING FACECREAM CONTAINING TINOSPORA CORDIFOLIA

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ABSTRACT

The present study focuses on the formulation and evaluation of a polyherbal anti-aging face cream containing *Tinospora cordifolia* as a key active ingredient. The research aims to develop a natural, effective, and safe skincare product that reduces visible signs of aging and enhances skin health. The formulation includes herbal components such as saffron (*Crocus sativus*) and nutmeg *(Myristica fragrans),* known for their antioxidant and skin-rejuvenating properties. The cream was prepared as an oil-in-water (O/W) emulsion using standard cosmetic ingredients such as olive oil, cetyl alcohol, stearic acid, glycerin, and vitamin E. the extraction of T.cordifolia was carried out using maceration, and its antioxidant potential was evaluated using the DPPH radical scavenging method. The final formulation underwent various physicochemical evaluations, including pH determination, homogeneity, stability, and antioxidant activity. The formulated cream exhibited good homogeneity, stability, and a pH value compatible with human skin (5.04). the antioxidant study demonstrated significant free radical scavenging activity (81%), indicating the efficacy of *T.cordifolia* and other herbal components in preventing oxidative stress-related skin aging. Additionally observational sensitivity tests confirmed the safety of formulation. The study highlights the potential of *T.cordifolia* based polyherbal formulations in anti-aging skincare, offering a natural alternative to synthetic products. The results suggest that the developed cream could be a promising candidate for commercial herbal skincare applications.

KEYWORDS: *Tinospora cordifolia*, antiaging, polyherbal cream, antioxidants, skincare, herbal formulations.

I. INTRODUCTION

The skin is the largest organ of the human body, composed of multiple layers that serve as a protective barrier. However as aging progresses, both intrinsic (genetic) and extrinsic (environmental) factors contribute to visible skin aging. UV radiation, pollution, lifestyle habits and oxidative stress accelerate this process, leading to wrinkles, dryness, loss of elasticity, and uneven skin tone. Anti-aging interventions focus on combating oxidative stress, enhancing collagen synthesis and improving overall skin texture.

Aging is a complex biological process influenced by intrinsic (Genetic) and extrinsic (Environmental) factors, leading to wrinkles, loss of skin elasticity, and pigmentation. Herbal cosmetics are gaining popularity due to their safety, efficacy, and minimal side effects.[4]

This study explores the formulation of a polyherbal anti-aging cream utilizing *Tinospora cordifolia*, which is known for its antioxidant, anti-inflammatory, and immunomodulatory properties. The cream also incorporates other potent herbal ingredients, including saffron (*Crocus sativus*) and nutmeg oil (*Myristica fragrans*), known for their skin-brightening and rejuvenating effects.

II. MATERIALS AND METHODOLOGY

Materials

❖ **Active ingredients**

- *Tinospora cordifolia* (Collected from Malappuram, Kerala)
- Saffron (*Crocus sativus*)
- Nutmeg oil *(Myristica fragrans*)

❖ **Other excipients**

- Olive oil
- Carbopol 940
- Cetyl alcohol
- Stearic acid
- Glycerin, propylene glycol
- Triethanolamine.

- Rose oil, Vitamin E

Methodology

1. Selection of plant

*Tinospora cordifolia, (*Common names: heart leaved, amrita, guduchi, gurbel or giloy) of the family *Menispermacea* is selected for the formulation.

The fresh stems of *Tinospora cordifolia* were collected. They were identified and Herbarium specimen has been maintained.

2. Extraction of *tinospora cordifolia*

The stems were dried at 60^0C. Aqueous extract of *T.cordifolia* stem were prepared by cold maceration method. Separate 100g of stem coarse powder and soaked in 1000ml for 72 hrs at 37^oC with periodic mixing with double distilled water. The extracts were filtered through a muslin cloth on fourth day. The filtered material were kept on water bath to eliminate surplus water. TC stem extracts were placed in a glass beaker and evaporated for 7 to10 hrs daily for 2 to 3 days in a water bath set to 60^oC, until a semi-solid extracted liquid was formed. The semisolid extracts were then stored.[13,14]

3. Standardization of nutmeg oil

Refractive index: Determined by Abbe's refractometer, Place a few drops of the sample liquid on the prism, close the prism, adjust the light source and telescope until a sharp boundary line appears between the illuminated and dark regions, then read the refractive index directly from the scale on the telescope, aligning the boundary line with the crosshairs in the eyepiece.[19]

Density: Determined by using pycnometer.[19]

Density of sample is determined by using equation:

Density = $(M_2 - M_1)$ / Flask volume.

Where, M_1 = mass of empty pycnometer

M_2 = mass of pycnometer filled with oil.

4. Standardization of saffron

The isolation of crocetin in saffron is done by using preparative thin layer chromatography on pre-coated TLC plates of 20 x 20 cm.[20]

Mobile phase used – toluene: acetone: water: acetic acid (16:2:2:2)

Compare the R_f value of crocetin spot with those of standards.

R_f value = (distance travelled by the compound) / (distance travelled by solvent front)

5. Formulation of anti-aging cream

The oil phase (olive oil, cetyl alcohol, stearic acid, vitamin E) and the water phase (Carbopol 940, glycerin, propylene glycol) were separately heated to 70^0C and then mixed. *Tinospora* extract, saffron, and nutmeg oil were incorporated, and triethanolamine was added to adjust the pH. The final emulsion was stirred until uniform.[21,22]

6. Evaluation of the formulation

6.1 Physical appearance

Color, Texture, Homogeneity were usually assessed.

6.2 pH measurement

pH was measured using a digital pH meter.

6.3 Emulsion type determination

- Dye test: mixed with scarlet red and observed under a microscope.
- Dilution test: miscibility with water confirmed an oil-in-water (O/W) emulsion.[24]

6.4 After feel

Emolliency, slipperiness and amount of residue left after application of fixed amount of cream were checked.

6.5 Spreadability test

Evaluated by applying a fixed amount on the skin and observing absorption time.[24]

6.6 Acid value

10 g of the cream was dissolved in 50 ml mixture of equal volume of alcohol and solvent ether in a flask. The flask is connected to a reflux condenser and slowly heated, until the sample dissolve completely, to this 1 ml of phenolphthalein was added and titrated with 0.1N KOH, until faintly pink colour appears after shaking for 30 sec. [24]

Acid value = n*5.61/w

n = the number of ml of KOH required; w = the weight of cream.

6.7 Saponification value

2 g of the cream was refluxed with 25 ml of 0.5 N alcoholic KOH for 30 min, to this 1 ml of phenolphthalein is added and titrated immediately, with 0.5 N HCL. [24]

Saponification value = (b-a) *28.05/w

a = the volume in ml of titrant.

b = the volume in ml of blank titrant.

w = the weight of cream.

6.8 Antioxidant activity (DPPH Assay)

The cream's free radical scavenging ability was tested using DPPH solution at 517 nm.[25]

Determination of antioxidant activity: The FR scavenging activity of the H-donor ability was assessed using an ethanol solution of 2,2-diphenylpicrylhydrazyl (DPPH), a stable FR. FR scavenging activity of an anti-aging cream formulation was determined by DPPH which acts as a stable FR. [25,26]

Sample preparation: About 10 mg cream formulations were weighed and dissolved in ethanol. Prepared sample was filtered by the Whatman filter paper, and volume made up to 10 ml in a volumetric flask.

Preparation of standard: Accurately weighed 10 mg of ascorbic acid and dissolved in 10 ml of ethanol. From this solution, take 2.5 ml and make up the volume upto 25 ml with ethanol thus the stock solution is prepared. This stock solution was serially diluted separately to obtain different concentrations.

Procedure: Up to 3 ml of 0.004%, ethanolic DPPH solution was added with the 0.5 ml sample solution. At 517 nm DPPH shows its absorbency and at the same wavelength sample absorbance was taken by a UV spectrophotometer after 30 min and then comparison was made between the absorbance of a sample and the absorbance of ascorbic acid (standard) Then, the percentage inhibition was calculated by the following equation.[25]

$$\% \text{ Inhibition} = \frac{(\text{Absorbance of control} - \text{Absorbance of the sample}) \times 100}{\text{Absorbance of control}}$$

III. RESULTS AND DISCUSSION

3.1 Collection and authentication of plant material

The plant material was collected from Perumpadappu, Malappuram dt, Kerala. and authenticated from Botany department of SN college of arts and science, Pattambi, Palakkad dt.

3.2 Extraction

Extraction was carried out by cold maceration method and semisolid extract was produced with percentage yield of 17.78%.

3.3 Standardization of saffron

The standardization of crocetin was carried out using Thin Layer Chromatography (TLC) on a silica gel plate.

The distance travelled by the solvent front was measured, and the distance travelled by crocetin was also recorded. According to available research, the standard Rf value for crocetin on a TLC plate typically falls within the range of 0.40 to 0.50.

R_f Value Calculation:

R_f = 2.1/5 **= 0.42**

Thus, the R_f value of crocetin under the given experimental conditions was **0.42.**

3.4 Standardization of nutmeg oil

These are the characteristic observation that results from the standardisation of nutmeg oil.

Table 1: standardization of nutmeg oil.

Sl. No.	Parameters	Nutmeg oil
1	Color	Pale yellow
2	Odor	Typical &Characteristic
3	ISO number	3215:1998
4	Refractive index	1.472
5	Density	0.9012 kg/m^3

3.5 Evaluation of the formulated cream

Properties	Results
Colour	Yellowish cream
Odour	Characteristic
Texture	Smooth, creamy, thick
State	semisolid
Grittiness	No grittiness

Consistency	Good
Phase separation	Absent
Greasiness	Absent
Absorption	Within 1 minutes

3.5.1 Physical evaluation: Organoleptic characteristics of cream.

3.5.2 Emulsion type

- Dye test showed red globules dispersed in a white background, confirming an oil-in-water (O/W) emulsion.
- Dilution test: the cream was miscible with water, further confirming its oil-in-water nature.

3.5.3 pH value of the cream

Determined using pH meter.

3.5.4 Acid value

3.5.5 Saponification value

Table 3: pH value, acid value, saponification value.

Sl. No.	Properties	Results
1	Ph	5.04
2	Acid value	20.13mg KOH/g
3	Saponification value	45.91mg KOH/g

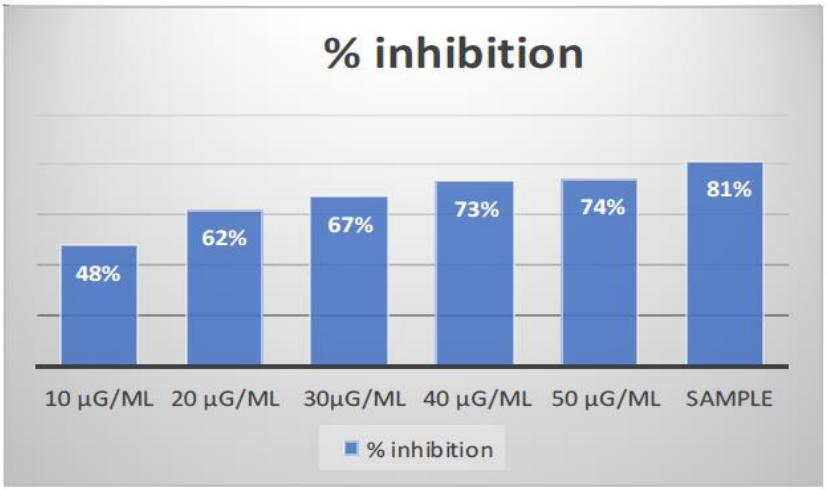
3.5.6 Antioxidant activity

The antioxidant activity of antiaging cream formulation containing *Tinospora cordifolia* was assessed using DPPH radical scavenging activity and by taking ascorbic acid as standard.

Table 4: DPPH radical scavenging activity of Sample and Standard (Ascorbic acid).

Sl. No.	Concentration (µg/ml)	Absorbance	% inhibition (%)
1	10	0.052	48
2	20	0.038	62
3	30	0.033	67
4	40	0.027	73
5	50	0.026	74
6	Sample	0.019	81

Formulation shows maximum percentage inhibition of about 81% as compared to std ascorbic acid which shows maximum 75% inhibition (50µg/ml) of DPPH.



Conc v/s % inhibition

DPPH radical scavenging activity of sample and standard (ascorbic acid)

The antioxidant activity of both the cream base and *Tinospora cordifolia* extract-loaded cream was evaluated using the DPPH radical scavenging assay.

The results were compared with a standard antioxidant (Ascorbic acid) to determine the effectiveness of the formulation in neutralizing free radicals.

The cream base (Without extract) showed no antioxidant activity (Negative inhibition values), confirming that the polyherbal extract was responsible for the observed antioxidant effect

Formulation	Absorbance	% inhibition
Cream base	0.167	-67%
Extract loaded cream	0.019	81%

%inhibition of cream base and extract loaded cream

IV. CONCLUSION

The formulation and evaluation of the polyherbal anti-aging face cream containing *Tinospora cordifolia* successfully demonstrated its stability, safety, and effectiveness. The cream was formulated as an oil-in-water (O/W) emulsion, ensuring ease of application and better skin compatibility. Physicochemical evaluations confirmed its stable consistency, appropriate pH (5.04), and absence of phase separation.

The antioxidant study revealed that the cream exhibited significant free radical scavenging activity (81% inhibition), indicating strong anti-aging potential. The presence of bioactive

compounds from *Tinospora cordifolia*, saffron, and nutmeg oil contributed to the cream's ability to protect against oxidative stress, a key factor in skin aging.

In conclusion, the polyherbal anti-aging cream offers a natural and effective skincare solution with strong antioxidant properties. Its formulation aligns with the growing demand for herbal cosmetics, providing a promising alternative to synthetic anti-aging products. Further clinical studies and user trials can help validate its long-term efficacy and consumer acceptance.

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