IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# FORMULATION AND EVALUATION OF POLYHERBAL FACIAL CREAM CONTAINING *CURCUMA LONGA AND ALOE BARBADENSIS*

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## ABSTRACT

This study focuses on the development of a polyherbal facial cream containing curcuma longa (turmeric) and aloe barbadensis (aloe vera) extracts and evaluates its physicochemical properties, stability, and potential benefits for the skin. The introduction highlights the therapeutic properties and traditional use of these botanical ingredients in skincare. Curcuma longa is known for its antioxidant, anti-inflammatory, and antimicrobial properties, while aloe barbadensis offers moisturizing, soothing, and wound-healing effects, along with anti-inflammatory properties and collagen synthesis enhancement. The method of preparation involves two phases: the oil phase and the aqueous phase. The oil phase consists of ingredients such as stearic acid, white bees wax, stearyl alcohol, and cetyl alcohol, while the aqueous phase includes propylene glycol, triethanolamine, methyl paraben, propylparaben, and water. These phases are prepared separately and then combined to form the cream formulation. Overall, this study aims to contribute to the development of natural, effective, and safe skincare products by formulating a polyherbal cream containing Curcuma longa and Aloe barbadensis extracts and evaluating its properties and benefits for the skin.

## KEYWORDS

Polyherbal, Cream, *Curcuma longa*, *aloe barbadensis*

## INTRODUCTION

Polyherbal formulations, combining multiple botanical ingredients, have gained significant attention in the field of skincare due to their potential synergistic effects and holistic approach to addressing various skin concerns. Among the numerous botanical extracts utilized in cosmetic formulations, Curcuma longa (turmeric) and Aloe barbadensis (aloe vera) have emerged as prominent ingredients, valued for their therapeutic properties and longstanding traditional use in skincare.

Curcuma longa, a perennial plant native to South Asia, has been extensively studied for its bioactive components, notably curcuminoids. Curcumin, the principal curcuminoid found in turmeric, possesses antioxidant, anti-inflammatory, and antimicrobial properties, making it a promising ingredient in skincare formulations. Its ability to scavenge free radicals and inhibit inflammatory pathways can help protect the skin from oxidative stress and reduce the signs of aging, including wrinkles and pigmentation disorders.

The succulent shrub Aloe barbadensis, also known as aloe vera, has been used for millennia in traditional medicine and cosmetics. The gel extracted from aloe vera leaves contains a variety of bioactive compounds,

including polysaccharides, vitamins, minerals, and enzymes. These components contribute to aloe vera's moisturizing, soothing, and wound-healing properties. Aloe vera also exhibits anti-inflammatory effects, enhances collagen synthesis, and improves the skin's elasticity, making it a valuable ingredient for skincare products.

In this study, we aim to develop a polyherbal facial cream containing Curcuma longa and Aloe barbadensis and evaluate its physicochemical properties, stability, and potential benefits for the skin. By exploring the formulation of this polyherbal cream, we seek to contribute to the development of natural, effective, and safe skincare products. (1-4)

**Method of Preparation (5,6,7)**

**Oil phase preparation (part a):** The ingredients used in the oil phase are Stearic Acid, White Bees Wax, Stearyl Alcohol, and cetyl Alcohol. White Bees Wax, stearic acid, stearyl alcohol, and cetyl alcohol were added to a beaker and allowed to melt. The temperature of the oil phase is maintained between 65 –70°C.

**Aqueous phase preparation (part b):** Ingredients used in the aqueous phase are Propylene Glycol, Triethanolamine, Methyl Paraben, Propyl paraben, and Distilled Water. The water was heated to a temperature of 65-70 °C. Propylene Glycol, Triethanolamine, Methyl paraben, and Propyl paraben were weighed out and added to the phase, which was kept at a temperature of 65 to 70 °C.

**Development of cream formulation (part a + part b):** The oil phase and aqueous phase are brought at the same temperature, then the oil phase is slowly incorporated into the aqueous phase at 65-70°C and mixed for 10 to 15 Minutes in a mortar pestle with moderate agitation in a clockwise direction until the temperature is dropped to 40°C and a clicking sound is heared.

Table no.1 Formulation of Herbal Facial Cream

| **Ingredient** | **F1** | **F2** | **F3** | **F4** | **F5** | **F6** | **F7** | **F8** | **F9** |
|---|---|---|---|---|---|---|---|---|---|
| *Curcuma longa* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Aloe barbadensis | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Honey | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Coconut oil | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Stearic Acid | 0.4 | 0.1 | 0.25 | 0.0378 | 0.25 | 0.1 | 0.25 | 0.4621 | 0.4 |
| White Bees Wax | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Stearyl Alcohol | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Cetyl Alcohol | 0.1 | 1.2 | 0.65 | 0.65 | -0.1278 | 0.1 | 0.4278 | 0.65 | 1.2 |
| Propylene glycol | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Triethanolamine | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Methyl Paraben | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| Propyl paraben | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| Distilled Water | Q.s. | Q.s. | Q.s. | Q.s. | Q.s. | Q.s. | Q.s. | Q.s. | Q.s. |

**Result and Discussion**

**Determination of extract using UV spectroscopic method:**

Determination of extract of *Curcuma longa* using UV spectroscopic method

UV Spectrum of *Curcuma longa* extract (maximum wavelength was found to be 425nm).

Table no.2 UV analysis of *Curcuma longa* extract

| Sr.no. | Concentration | Absorbance (λ max at 246nm) |
|---|---|---|
| 1. | 0.2 µg | 0.047 |
| 2. | 0.4 µg | 0.061 |
| 3. | 0.6 µg | 0.080 |
| 4. | 0.8 µg | 0.107 |
| 5. | 1.0 µg | 0.125 |
| 6. | **$R^2$** | 0.9969 |

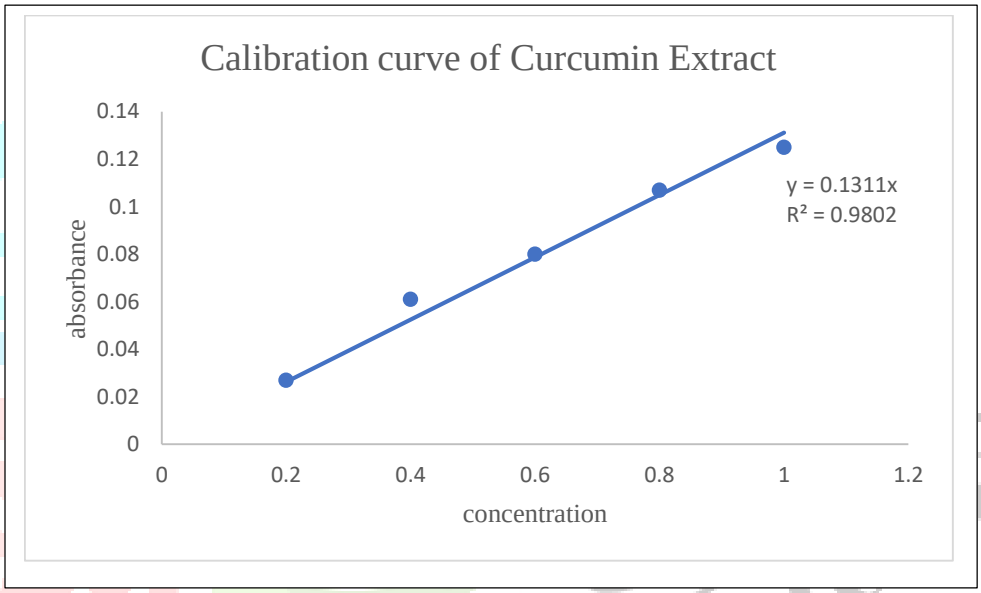


Fig no.1 *Curcuma longa* extract UV Calibration curve

Determination of the extract of Aloe barbadensis Miller by UV spectroscopic method:

UV Spectrum of *Aloe barbadensis miller* extract (maximum wavelength was found to be 263nm).

Table no. 3 UV analysis of the extract of Aloe barbadensis Miller

| Sr.no. | Concentration | Absorbance (λ max at 246nm) |
|---|---|---|
| 1. | 0.2 µg | 0.011 |
| 2. | 0.4 µg | 0.018 |
| 3. | 0.6 µg | 0.023 |
| 4. | 0.8 µg | 0.03 |
| 5. | 1.0 µg | 0.036 |
| 6. | **R2** | 0.9979 |

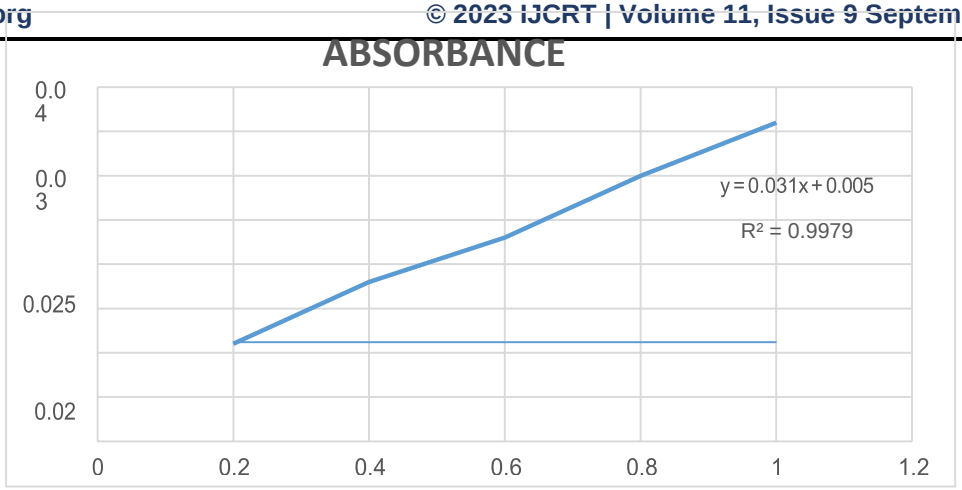


Fig no.2 Aloe barbadensis miller extract UV calibration curve

**FTIR Study**

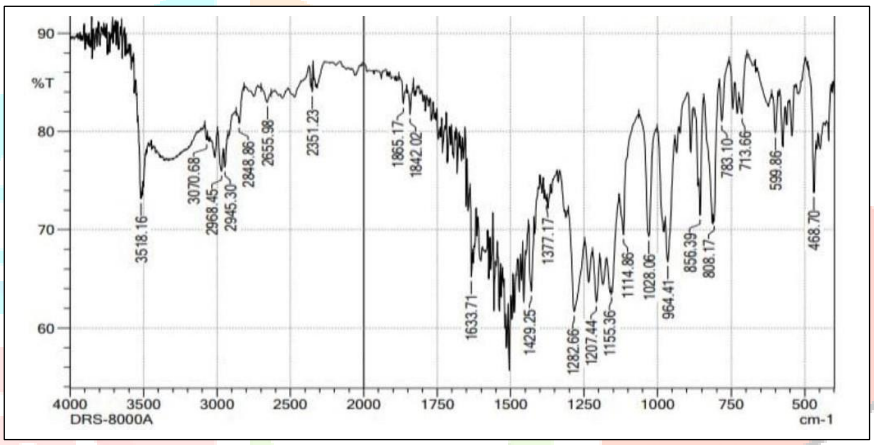


Fig no. 3 FTIR of *curcuma longa*

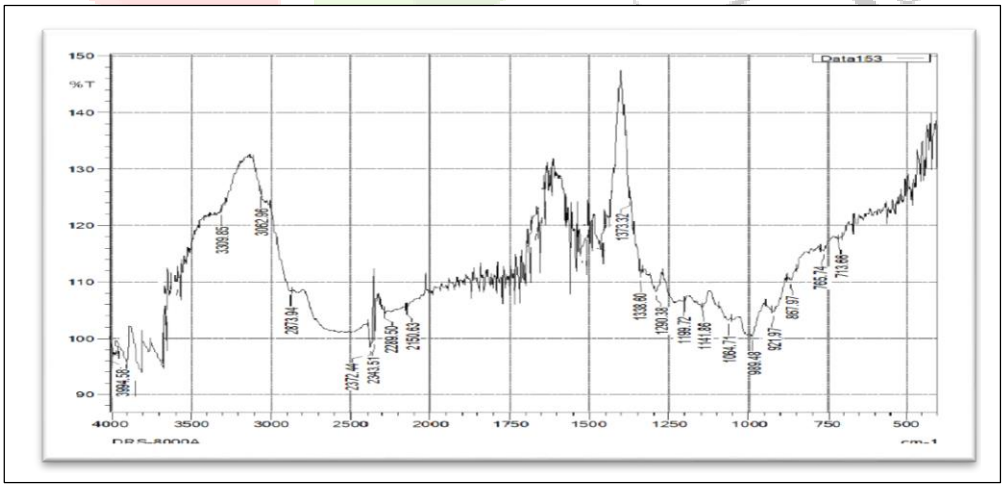


Fig no. 4 FTIR of *Aloe barbadensis*

**HPTLC Analysis of Extracts:**

HPTLC analysis of *Curcuma longa* extract:

Photo-documentation of *Curcuma longa* extract:

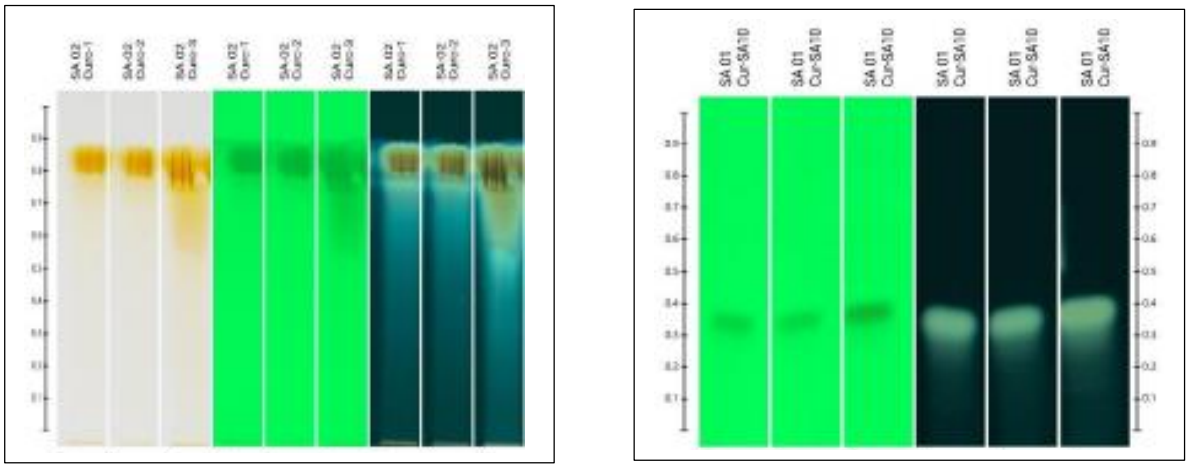

Fig. Photo documentation at 1) Visible 2) 254 nm and 3) 366 nm

Fig no. 5 Photo-Documentation of *Curcuma longa* extract

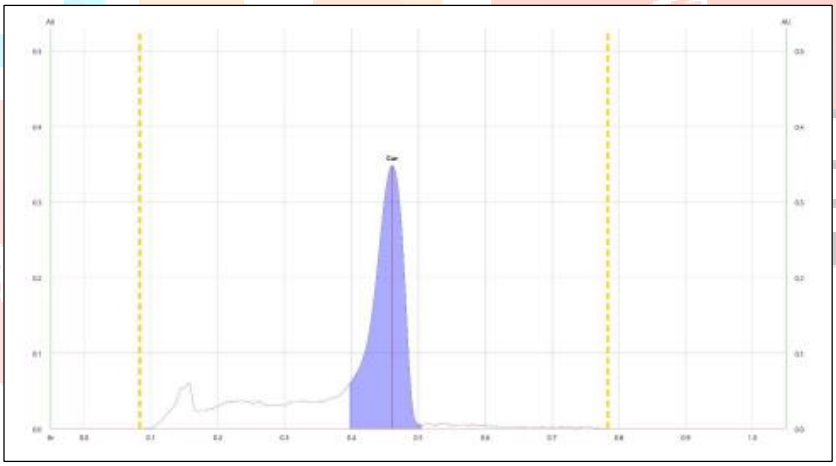

Fig no. 6 Densitogram of *Curcuma longa*

**Observation:**

a) The peak can be seen at the solvent front and also there is merging of bands.

b) Both UV 254 and UV 366 nm show a peak. The peak was once more scanned at 422 nm, the maximum wavelength for curcumin, and the densitogram was obtained.

c) Scan results revealed an Rf of 0.47.

HPTLC analysis of *Aloe barbadensis miller* extract:

Photo-documentation of *Aloe barbadensis miller* extract

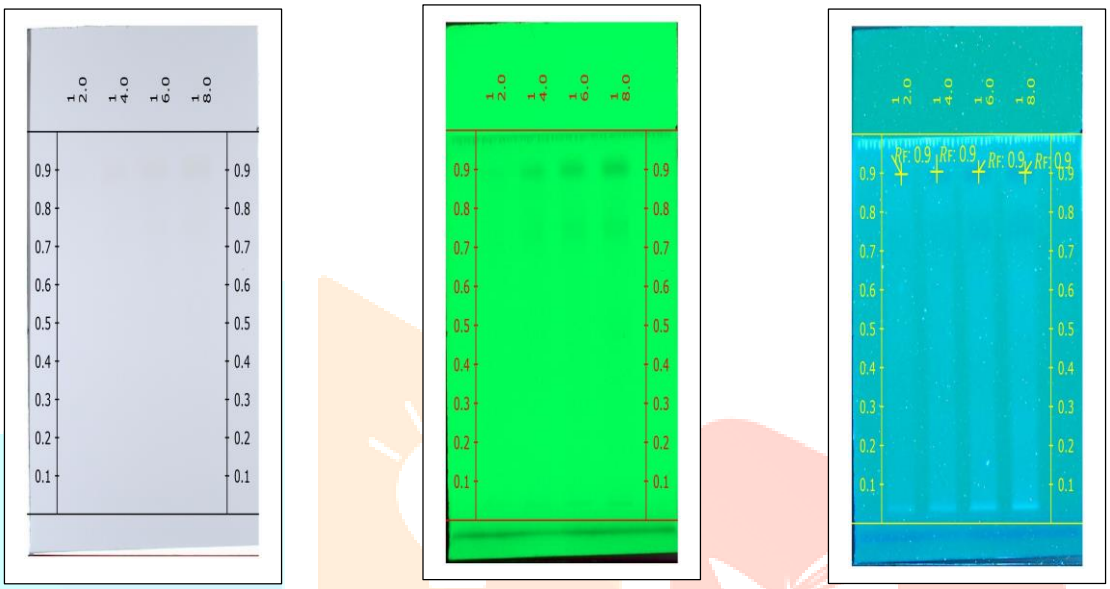

Fig no. 7 Photo-Documentation of *aloe barbadensis miller* extract

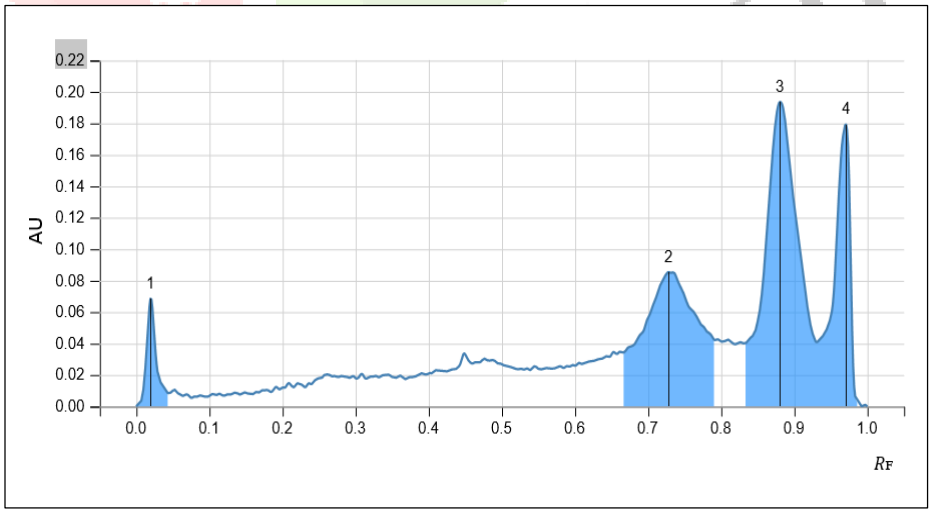


Fig no. 8 Representative Densitogram of *aloe barbadensis miller*

**Evaluation of Cream:**

**Organoleptic Evaluation:**

Organoleptic evaluation of all 9 batches was performed. The color, Texture, homogeneity, and foreign particles of formulated batches were observed in table.

Table no. 4 Organoleptic Evaluation

| Batch | Color | Texture | Homogeneity | Foreign particles |
|---|---|---|---|---|
| Batch no. F1 | Faint Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F2 | Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F3 | Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F4 | Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F5 | Dark Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F6 | Dark Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F7 | Dark Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F8 | Yellowish | Smooth | Excellent | Free from foreign particles |
| Batch no. F9 | Yellowish | Smooth | Excellent | Free from foreign particles |

**Measurement of PH**

Digital pH meter was used to measure the pH of Herbal Cream. The evaluation of all 9 batches was performed. The PH of all batches shows the pH range that is suitable for the skin pH and the result is shown in table.

Table no. 5 Observed pH

| Formulation no. | Observed PH |
|---|---|
| Batch no. F1 | 6.3 |
| Batch no. F2 | 6.9 |
| Batch no. F3 | 5.9 |
| Batch no. F4 | 6.0 |
| Batch no. F5 | 5.7 |
| Batch no. F6 | 5.1 |
| Batch no. F7 | 6.2 |
| Batch no. F8 | 5.6 |
| Batch no. F9 | 5.8 |

**Spreadability:**

By placing a sample between two slides, then compressing it to uniform thickness and by setting the definite weight for a specified period, the spreadability of herbal cream has been measured which is shown in the table. (8)

Table no. 6 Observed Spreadability

| **Formulation no** | **Observed Spreadability [CM]** |
|---|---|
| Batch no. F1 | 3.9cm |
| Batch no. F2 | 4.2cm |
| Batch no. F3 | 2.26cm |
| Batch no. F4 | 1.8cm |
| Batch no. F5 | 3.2cm |
| Batch no. F6 | 3.6cm |
| Batch no. F7 | 3.9cm |
| Batch no. F8 | 3.5cm |
| Batch no. F9 | 3.7cm |

**Viscosity**

The Brooke field viscometer was used to perform the viscosity of herbal cream. The cream was dipped into a viscometer and readings of the cream were observed at room temperature and the result is given in table. (8,9)

Table no.7 Observed Viscosity

| **Formulation no.** | **Observed viscosity** |
|---|---|
| Batch no. F1 | 14162cp |
| Batch no. F2 | 15870cp |
| Batch no. F3 | 15283cp |
| Batch no. F4 | 15120cp |
| Batch no. F5 | 14000cp |
| Batch no. F6 | 13976cp |
| Batch no. F7 | 13988cp |
| Batch no. F8 | 13957cp |
| Batch no. F9 | 12999cp |

**Drug Diffusion Test:**

The in vitro drug release from cream was carried out using Franz diffusion cell at 50 RPM and 37°C+0.5°C. All Phosphate buffer was used as the dissolution medium. 1 ml of dissolution medium was withdrawn at predetermined time intervals and fresh dissolution was replaced. The sample was withdrawn at regular intervals and analyzed by UV-spectrophotometer at 246 nm and 263 nm for the presence of the drug and the result is shown in table.

Table no.8 Observed Drug Release

| **Formulation no.** | **Observed drug release** |
|---|---|
| Batch no. $F_1$ | 62.785% |
| Batch no. $F_2$ | 58.063% |
| Batch no. $F_3$ | 91.365% |
| Batch no. $F_4$ | 52.458% |
| Batch no. $F_5$ | 29.53125% |
| Batch no. $F_6$ | 45.235% |
| Batch no. $F_7$ | 72.975% |
| Batch no. $F_8$ | 83.125% |
| Batch no. $F_9$ | 64.658% |

**Wash Ability**

A small amount of formulated cream was applied to the skin and the ease of washing of cream with water was checked.

Table no. 9 Observed Washability

| **Formulation no.** | **Observed Washability** |
|---|---|
| Batch no. $F_1$ | Easily washable |
| Batch no. $F_2$ | Easily washable |
| Batch no. $F_3$ | Easily washable |
| Batch no. $F_4$ | Easily washable |
| Batch no. $F_5$ | Easily washable |
| Batch no. $F_6$ | Easily washable |
| Batch no. $F_7$ | Easily washable |
| Batch no. $F_8$ | Easily washable |
| Batch no. $F_9$ | Easily washable |

**Centrifugation Test**

The centrifugation testing was carried out for all 9 herbal cream formulations when the creams are placed in a centrifuge machine and then they don't show any separation of two phases then all 9 formulations pass centrifugation testing. (10)

Table no. 10 Centrifugation Test

| **Formulation no.** | **Centrifugation test** |
|---|---|
| Batch no. F1 | No phase separation |
| Batch no. F2 | No phase separation |
| Batch no. F3 | No phase separation |
| Batch no. F4 | No phase separation |
| Batch no. F5 | No phase separation |
| Batch no. F6 | No phase separation |
| Batch no. F7 | No phase separation |
| Batch no. F8 | No phase separation |
| Batch no. F9 | No phase separation |

**Freeze and Thaw Test**

The cream was exposed to low temperature in a refrigerator and then brought to room temperature. Results were observed for all 9 batches visually such as changes in the color and results are shown in table (11).

Table no. 11 Freeze and Thaw Test

| **Formulation no.** | **Freeze and Thaw Test** |
|---|---|
| Batch no. F1 | Passes |
| Batch no. F2 | Passes |
| Batch no. F3 | Passes |
| Batch no. F4 | Passes |
| Batch no. F5 | Passes |
| Batch no. F6 | Passes |
| Batch no. F7 | Passes |
| Batch no. F8 | Passes |
| Batch no. F9 | Passes |

**Particle Size of Cream:**

**Globule size and its distribution in Cream-**

The globules in the formulation were found to have an average size of 100 nm and a zeta potential of -2.1 mv. In photomicrograph, appropriately diluted emulsions of the optimized batches were observed under a light microscope at 40x.Almost spherical globules of emulsion were seen in the photomicrograph. Though this study does not give any exact estimate of size however it gives a general idea about formation of cream and success of the method used. (12,13)

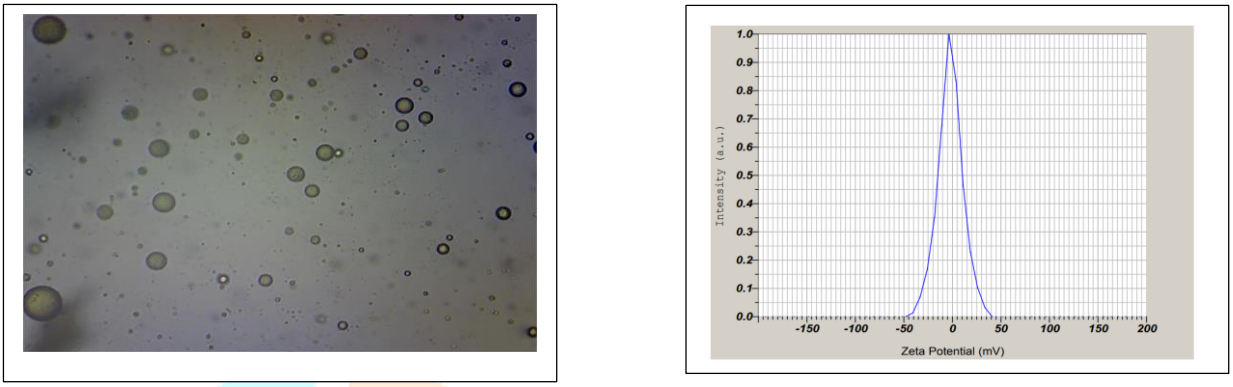


Fig no. 9 Particle Size of Formulated Batch

**After Feel Test**

All 9 batches of the herbal cream formulation underwent an after-feel test. The sample of cream has been tested for its smoothness, emollient characteristics and the amount of residue that remained after it was applied. (14,15)

Table no. 12 after Feel Test

| **Formulation no.** | **After feel test** |
|---|---|
| Batch no. F1 | Emollient |
| Batch no. F2 | Emollient |
| Batch no. F3 | Emollient |
| Batch no. F4 | Emollient |
| Batch no. F5 | Emollient |
| Batch no. F6 | Emollient |
| Batch no. F7 | Emollient |
| Batch no. F8 | Emollient |
| Batch no. F9 | Emollient |

**Accelerated Stability Study:**

The formulated herbal cream was tested for accelerated stability by in vitro evaluation of herbal cream it was placed in a stability chamber at different temperatures ($20^0$c ± 1°C and $40^0$c ± 1°C) for 30 days. All the formulations were found to be stable upon storage for 30 days. No change was observed in their appearance, pH, homogeneity, spreadability, viscosity, after-feel, Washability, and irritation result are shown in table. (16)

Table no. 13 Accelerated Stability Study

| **Formulation no.** | **Accelerated Stability Study** |
|---|---|
| Batch no. F1 | No change was observed. |
| Batch no. F2 | No change was observed. |
| Batch no. F3 | No change was observed. |
| Batch no. F4 | No change was observed. |
| Batch no. F5 | No change was observed. |
| Batch no. F6 | No change was observed. |
| Batch no. F7 | No change was observed. |
| Batch no. F8 | No change was observed. |
| Batch no. F9 | No change was observed. |

**Antimicrobial Activity Study:**

The facial activity of the optimized batch (F3) of the formulation was carried out. The culture was used as Staphylococcus aureus and the antimicrobial test was performed using the agar well diffusion. The method used was the Cup plate method and the agar media used is sabouraud dextrose agar result is shown in table.

Table no. 14 Zone of Inhibition Study

| Formulation sample. | Observed Zone of inhibition |
|---|---|
| Marketed formulation | 11 ± 1 |
| **Optimized batch F3** | **12.46. ± 1.50** |

Fig no. 10 zone of inhibition of batch F3

The zone of inhibition for marketed formulation was found to be 11 ± 1 cm and facial cream prepared was found to be 12.46± 1.50 cm.

## CONCLUSION

The main objective of this study was to formulate an herbal cream. The efficient selection of medicinal plants and their extract with correct concentration with perfect formulation can show a good medicinal effect on the body and it may increase the potency of drugs and formulation. The use of *Curcuma longa* (turmeric) and *Aloe barbadensis miller* (aloe vera) herbal cream shows a facial effect and all these herbal ingredients showed various activities such as antimicrobial, antibacterial, antiviral, Antiprotozoal, Antihelmintic, Anti-diabetic. The herbal cream formulation is stable at room temperature and can be effectively used against various diseases on the skin. The cream containing turmeric and aloe vera was tested for various physiochemical tests and the results were found according to the standard value. Herbal creams are a better substitute than synthetic cream formulations.

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