

Original Article

FORMULATION AND *IN VITRO* EVALUATION OF ETHANOLIC EXTRACT OF POLYHERBAL FACE CREAM

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Received: 08 Nov 2021, Revised and Accepted: 10 Jan 2022

ABSTRACT

Objective: The aim of the present research work was to formulate and evaluate polyherbal face cream using ethanolic extracts of Aloe Vera gel, Neem, Turmeric and Mint.

Methods: Extraction was done by the cold maceration technique. The cream was prepared by using the slab technique for homogeneous mixing of all the excipients and the herbal extracts. Three formulations of Oil in Water (O/W) type herbal cream were developed, namely F1, F2, and F3.

Results: All the formulations were evaluated for various physical characteristics viz. pH 6.1-6.3, Spreadability 5-7.5gcm/sec, Viscosity 591-638 Cps, Extrudibility 2564-5102 g/cm², good appearance and no phase separation was observed. Based on the results, F1 was found to be an optimized formulation with a smooth texture, good spreadability, extrudability and adequate viscosity. Stability studies as per ICH (International Council on Harmonisation) guidelines, revealed that the optimized formulation was stable at 25 °C±1 °C and 6% RH.

Conclusion: Based on the results and discussion, the prepared formulations were found to be yellow in colour with a pleasant odour and smooth texture. All the formulations had almost constant pH, homogenous, emollient and non-greasy. As single plant extract possibly cannot increase the extent of efficiency of medicinal and cosmetic property compared to polyherbal plant extract. Considering that, we mixed polyherbal extracts to improve the cosmetic properties of the prepared polyherbal face cream. Hence it can be concluded that the cream was stable and can be safely used topically.

Keywords: Aloe barbadensis (gel), Azadirachta indica (Neem), Curcumin longa (Turmeric), Mentha piperata (Mint.) ethanolic extract, Polyherbal cream, Cold maceration


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DOI: <https://dx.doi.org/10.22159/ijcpr.2022v14i2.1950> Journal homepage: <https://innovareacademics.in/journals/index.php/ijcpr>

INTRODUCTION

Creams are semisolid preparation used for the application to the skin. Cream may be considered as pharmaceutical products and cosmetics used in variety of skin conditions. Oil in Water (O/W) creams which are composed of small droplets of oil dispersed in continuous water phase. They are more comfortable and acceptable cosmetically; they are less greasy, easily washed off using water. Water in Oil (W/O) creams which are composed of small droplets of water dispersed in the continuous oil phase.

These are more difficult to handle. They are also moisturizing more as they provide oily barrier which reduce water loss from stratum corneum. Face creams are used as cosmetic for softening and cleaning action. Emollient are non-cosmetic moisture preparations which come in the form of creams, ointment, lotions and gels. Emollient help the skin to feel comfortable. They provide a protective film for the patient with conditions such as eczema or psoriasis. Emollient are an essential part of skin care. Emollient actions are used in skin beauty applications such as lipsticks, lotions and other cosmetic products [1].

Table 1: Herbal drug information

Name	Parts used	Uses	Figures
Aloe Vera (Aloe barbadensis Mill.)	Leaf (gel)	Anti-oxidant Cleansing soothing	
Neem (Azadirachta indica)	Leaf (powder)	Anti-oxidant Antiseptic	
Turmeric (Curcuma longa Linn.)	Leaf (powder)	Anti-oxidant Anti-aging Treats acne	
Mint (Mentha piperata Linn.)	Leaf (powder)	Anti-oxidant Anti-aging	

This polyherbal cream consists of crude drugs including Aloe Vera (*Aloe barbadensis* Mill.), Neem (*Azadirachta indica*), Turmeric (*Curcuma longa* Linn.) and Mint (*Mentha piperata* Linn.) The aim of present research work was to formulate and evaluate polyherbal cream containing hydroalcoholic extracts of Aloe Vera, Turmeric, Neem and Mint, which can give effects like moisturizer, reduce acne and skin irritation, dry skin and also adding glow to the face. They

are well known for its medicinal value in Indian traditional system of medicine and in Ayurvedic preparation. Refer table 1.

MATERIALS AND METHODS

Materials

Pharma grade or Laboratory Reagent (LR) were used as given in table 2.

Table 2: List of chemicals used with their grade and names of suppliers/manufacturers

S. No.	Material	Supplier
1.	Aloe barbadensis Mill. (Aloe Vera leaves)	Medicinal garden, RCCP, BELGAVI
2.	Azadirachta indica (Neem leaves)	Medicinal garden, RCCP, BELGAVI
3.	Curcuma longa Linn. (Turmeric rhizomes)	ICMR-NITM, BELAGAVI
4.	Mentha piperata Linn. (Mint leaves)	Medicinal garden, RCCP, BELGAVI
5.	Stearicacid	Seema chemicals
6.	LiquidParaffin	Burgoyne Burlidges and co.
7.	Beeswax	Burgoyne Burlidges and co.
8.	Borax	Spectrum reagent and chemicals pvt. ltd
9.	Glycerin	Seema chemicals
10.	Roseoil	Burgoyne Burlidges and co.
11.	Methylparaben	Burgoyne Burlidges and co.

Equipments

Table 3: Details of equipments used

S. No.	Instrument	Manufacturer/Supplier
1.	Electronic Balance	New Series Electronic Balance
2.	Hot Air Oven	Emkay Labs India
3.	Magnetic Stirrer	Remi Elektrotechnik Ltd.
4.	Brookfield Viscometer	Universal Scientific Works, Bengaluru

Plant collection and authentication

The leaf of *Aloe barbadensis* Mill. *Azadirachta indica* A. Juss., *Mentha piperita* Linn. and rhizome of *Curcuma longa* Linn., were collected in the month of June 2021 from the medicinal garden, college campus, Rani Chennamma College of Pharmacy, Belagavi, Karnataka, India. The Plant materials were authenticated by ICMR-National Institute of Traditional Medicine (NITM), Belagavi, Karnataka, India. The herbarium specimens of the same have been deposited in their herbaria with accession numbers RMRC-1656, RMRC-1657, RMRC-1658 and RMRC-1659, respectively.

Extraction methods

Extraction is the separation of medicinally active portions of plant using selective solvents through standard procedures. The purpose of all extraction is to separate the soluble plant metabolites, leaving behind the insoluble cellular marc (residue) [2].

Preparation of aloe vera gel extract

Mature, healthy and fresh aloe vera leaves were washed first under running tap water, followed by distilled water and air-dried for 3 d. Then the outer part of the leaf was dissected longitudinally using a sterile knife and gel that is the colorless, parenchymatous tissue was removed. 15g of inner juice of aloe vera leaves was heated at a constant temperature of 80 °C for 1 hour using both aqueous and ethanolic extracts, ratio of 0.1:3 solvent using magnetic stirrer as shown in fig. 1. Then the mixture is filtered using whatman filter paper no.1. The filtered product which is a clear aloe vera gel was used in the preparation as depicted in fig. 2 [3].

Preparation of turmeric, Neem and mint extracts

The fresh leaves of Neem, Mint and rhizomes of Turmeric were washed first under running tap water, followed by distilled water and air-dried at room temperature in the dark then grinded to powder using an electric blender. The powdered crude drugs of 5 gm were taken into the conical flask and 100 ml of ethanol was added to it, then the conical flask was capped with aluminium foil. Then this mixture was placed for maceration for 5 days as shown in fig. 3. After

maceration it is filtered using Whatman filter paper no.1 as depicted in fig. 4. Finally, the extract is collected and closed the mouth with aluminium foil which is further used to carry out the research work fig. 5. [4-6].



Fig. 1: Aloe vera gel extract using a magnetic stirrer



Fig. 2: Filtration process



Fig. 3: Extracts kept for maceration



Fig. 5: Extracts of natural plant ingredients



Fig. 4: Filtration process



Fig. 6: Slab and spatula

Table 3: Formulation design

Ingredients	Formulation		
	F1	F2	F3
AloeVera gel extract	1 ml	1 ml	1 ml
Neemextract	1 ml	1 ml	1 ml
Turmericextract	1 ml	1 ml	1 ml
Mintextract	1 ml	1 ml	1 ml
Stearic acid	1 gm	1.5 gm	1 gm
LiquidParaffin	2 ml	2 ml	1 ml
BeesWax	2 gm	2 gm	1.5 gm
Borax	2 gm	1 gm	3 gm
Glycerin	1 ml	1.5 ml	1 ml
Methylparaben	0.1 gm	0.1 gm	0.1 gm
Roseoil	Q. S.	Q. S.	Q. S.
distilled water	Q. S.	Q. S.	Q. S.
Total cream weight (mg)	30 gm	30 gm	30 gm

Preparation of polyherbal face cream [7]

Preparation of oil phase

Stearic acid, liquid paraffin, beeswax were taken into one porcelain dish and this mixture was heated at 75 °C.

Preparation of aqueous phase

Borax, methylparaben and distilled water were taken into another porcelain dish and heated this mixture at 75 °C.

Addition of aqueous phase to oil phase

The aqueous phase was added to the oil phase dropwise in a mortar with continuous stirring at 75 °C. Next the extracts were added according to ascending order of their volumes, followed by glycerin. Mixing was done by slab technique as shown in fig. 5. Perfume was added at last just before the finished product was transferred to the suitable container as depicted in fig. 7. Further cream was evaluated

for various physical parameters. The overview of polyherbal cream is shown in fig. 8.



Fig. 7: Polyherbal cream formulations

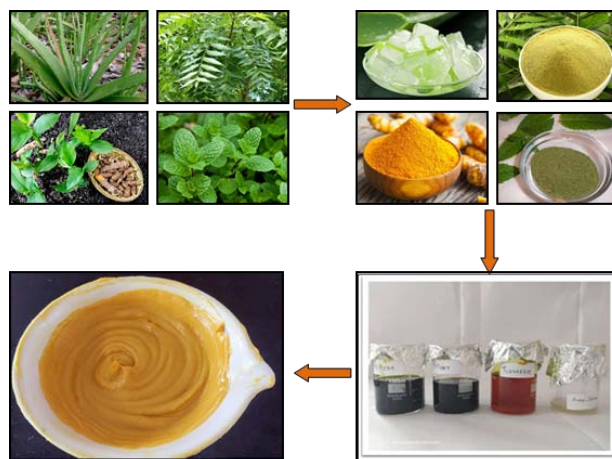


Fig. 8: Overview of polyherbal cream preparation

Evaluation of cream [8-14]

Physical properties

In this test, the cream was observed for colour, odour, texture and state.

Determination of pH

The pH meter was calibrated with the help of standard buffer solution. Weigh 0.5 gm of cream dissolved it in 50.0 ml of distilled water and its pH was measured with the help of a digital pH meter.

Phase separation

Prepared cream was kept in a closed container at room temperature, away from light. Then phase separation was checked for 24 h for 30 d. Any change in the phase separation was observed/checked.

Spreadability

The spreadability was expressed in terms of time in seconds taken by two slides to slip off from the cream placed in between the slides, under certain load. Lesser the time taken for separation of the two slides better the spreadability. Two glass slides of standard dimension were taken. Then one slide of suitable dimension was taken and the cream formulation was placed on that slide. Then the other slide was placed on top of the formulation. Then a weight or certain load was placed on the upper slide so that the cream between the two slides was pressed uniformly to form a thin layer. Then the weight was removed and excess of formulation adhering to the slides was scrapped off. The upper slide was allowed to slip off freely by the force of the weight tied on it. The time taken by the upper slide to slip off was noted.

$$\text{Spreadability} = m \times l / t$$

Where,

m= Standard weight, which is placed on the upper slide

l=length of a glass slide

t=time taken in seconds

Physical properties

Tube extrudability

It is a usual empirical test to measure the force required to extrude the material from the tube. More quantity extruded better was Extrudability. The formulation under study was filled in the clean, lacquered aluminum collapsible tube with nozzle tube of 5 mm opening and applies pressure on the tube by keeping weights. Tube Extrudability was then determined by measuring the amount of cream extruded through the tip when the pressure was applied on tube.

Type of emulsion test

Dilution test was conducted to determine the type of emulsion formed. In this method, to find out the oil in water emulsion, it was diluted with an aqueous solvent, whereas to find out the water in oil emulsion, it was diluted with an oily liquid.

Viscosity

Viscosity of formulated cream was determined by Brookfield Viscometer using spindle no.1 LV at 20 rpm at a temperature of 25 °C. The determination was carried out in triplicate and the average of three readings was recorded.

Stability studies of the optimized formulation: Stability of a pharmaceutical preparation can be defined as “the capability of a particular formulation in a specific container/closure system to remain within its physical, chemical, microbiological, therapeutic and toxicological specifications throughout its shelf life.”

Procedure

In the present study, stability studies were carried out at 25 °C ± 1 °C and 60% RH for a specific time period up to 30 d for the selected formulation. They were observed for the evaluation parameters like appearance, pH, Phase separation and Spreadability.

RESULTS AND DISCUSSION

The present study was undertaken to formulate and evaluate polyherbal face cream using ethanolic extract with a goal to minimize the side effects of synthetic face cream. The formulations were subjected to various physical evaluation parameters like physical properties, pH, phase separation, spreadability and tube extrudability, type of emulsion, viscosity and further stability studies. The results of the same are given below in the tabular form.

Table 4: Physical properties observation table

S.No.	Parameters	F1	F2	F3
1.	Colour	Yellow	yellow	yellow
2.	Odour	Pleasant	Pleasant	Pleasant
3.	Texture	Smooth	Smooth	Smooth
4.	State	Semi-Solid	Semi-Solid	Semi-Solid

The prepared formulation cream F1, F2 and F3 on visual observations were found to be homogeneous yellow-colored with a pleasant odour and smooth texture.

Determination of pH**Table 5: pH observation table**

S. No.	Formulation	pH
1.	F1	6.2
2.	F2	6.1
3.	F3	6.3

According to the results, the pH of all the three formulations that is F1, F2 and F3 were found to be in the range of 6.1 to 6.3, which is good for skin pH. All the formulations of cream were shown pH nearer to skin required i.e. 5-7 pH.

Phase separation**Table 6: Phase separation observation table**

S. No.	Formulation	Phase separation
1.	F1	No phase separation
2.	F2	No phase separation
3.	F3	No phase separation

Prepared cream was kept in a closed container at room temperature, away from light. Then phase separation was checked for 24 h for 30 d. According to the results, no phase separation was observed in all three formulations.

Spreadability**Table 7: Spreadability observation table**

S. No.	Formulation	Time (sec)	Spreadability (gcm/sec)
1.	F1	7	5
2.	F2	10	6.5
3.	F3	15	7.5

Among all the three formulations, for F1 the time taken by the two slides to separate is less so as said in the description of the evaluation test, lesser the time taken for separation of the two slides better the spreadability. So, according to this statement F1 showed desired Spreadability than F2 and F3 as shown in fig. 9.

**Fig. 9: Spreadability test****Tube extrudability****Table 8: Tube extrudability observation table**

S. No.	Formulation	Extrudability (g/cm ²)
1.	F1	2564
2.	F2	3184
3.	F3	5102

The formulation F1 showed desired Extrudability than F2, and F3. Test procedure is depicted in fig. 10 and graphical representation as shown in graph. 1.

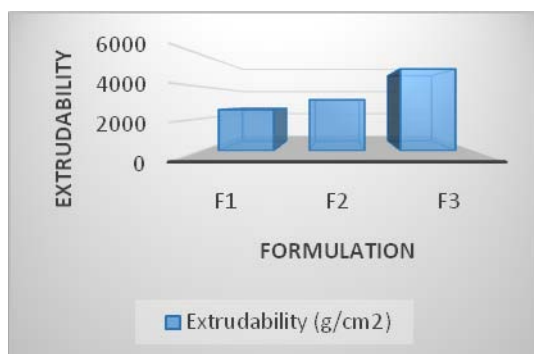
Type of emulsion test**Table 9: Emulsion test observation table**

S. No.	Formulation	Dilution test
1.	F1	O/W
2.	F2	O/W
3.	F3	O/W

All the three formulations were found to be of the O/W type of emulsion by dilution test.



Fig. 10: Tube extrudability test



Graph 1: Tube extrudability test of formulation

Viscosity

Table 10: Viscosity observation table

S. No.	Formulation	Viscosity (Cps)
1.	F1	638
2.	F2	591
3.	F3	612

Viscosity of cream was done by using Brookfield viscometer at a temperature 25 °C using spindle No. 1 at 20 RPM as shown in fig. 11. According to the results, the viscosity of the cream was in the range of 591-638 Cps.



Fig. 11: Viscosity study

Stability studies as per ICH guidelines

Table 11: Stability studies observation table of optimized formulation (F1)

Evaluation parameters					
Days	Temperature	Appearance	pH	Viscosity (Cps)	Spreadability (gcm/sec)
0	25 °C±1 °C	No change	6.8	601	5
7	25 °C±1 °C	No change	6.8	599	5
14	25 °C±1 °C	No change	6.7	629	5
21	25 °C±1 °C	No change	6.7	638	5.1
28	25 °C±1 °C	No change	6.7	619	5.4

The stability of the final optimized cream was evaluated every week for up to 30 d. the prepared formulation was found to be stable at room temperature. The value of pH, viscosity and spreadability were within the required range. There was no major difference in values of pH, viscosity, and spreadability compared to the initial value.

Extracts of Aloe vera gel, Neem, Turmeric and Mint are well known for its medicinal value in Indian traditional system of medicine and in Ayurvedic preparation. The Polyherbal face cream is O/W type emulsion, hence can be easily washed with plane water that gives better customer compliance. There is a growing demand for herbal cosmetics in the world market and they are an invaluable gift of nature. Therefore, we tried to make polyherbal face cream having multipurpose effects using ethanolic extract of Aloe vera gel, Neem, Turmeric and Mint. The formulation F1 had almost constant pH, homogenous, emollient, non-greasy and easily removed after the application at both room and elevated temperature. Study indicate that the formulation F1 found to be more stable compared to F2 and F3. Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. So, an herbal cream which is non-toxic, safe and effective and improves patient compliance by the utilization of herbal extracts would be highly acceptable.

CONCLUSION

The objective of the present work was to formulate and evaluate polyherbal face cream prepared by using ethanolic extract of Aloe Vera gel, Neem, Turmeric and Mint showing multipurpose effect such as whitening, anti-aging, antioxidant, antimicrobial effect.

Based on the results and discussion, the prepared formulations were found to be yellow in colour with pleasant odour and smooth texture. All the formulations had almost constant pH, homogenous, emollient, non-greasy and easily removed after the application at both room and elevated temperature.

F1 showed desired Spreadability and Extrudibility than F2 and F3. All three formulations were found to be of the O/W type of emulsion by dilution test. Hence can be easily washed with plane water that gives better customer compliance. Our study indicate that the formulation F1 found to be more stable compared to F2 and F3.

As single plant extract possibly cannot increase the extent of efficiency of medicinal and cosmetic property compared to polyherbal plant extract. Considering that, we mixed the extracts of

Aloe Vera gel, Neem, Turmeric and Mint to improve the cosmetic properties of the prepared polyherbal face cream.

Hence it can be concluded that the prepared polyherbal face cream was stable and can be safely used topically in order to protect skin against damage and prevent dry skin by moisturizing.

ACKNOWLEDGEMENT

I take this opportunity to thank Rani Chennamma College of Pharmacy, Belagavi for providing all the facilities to carry out this research work. We would like to put on record our sincere thanks to Dr. Harsha V. Hegde, ICMR-NITM, Belagavifor authentication of plants.

FUNDING

Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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