IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Research Article
July 2024 Vol.:30, Issue:7

Development and Characterization of Phytocosmeceutical Microemulgel for Skin Care

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Sreethu K Sreedharan*, Shafna M, Sreelakshmi R, Suparna D, Vrinda C

Department of Pharmaceutics, Grace College of Pharmacy, Palakkad-678004 India.

Submitted: 20 June 2024
Accepted: 27 June 2024
Published: 30 July 2024

Keywords: Microemulgel, carbapol, phytoconstituent, hyperpigmentation

ABSTRACT

The aim of the study was to formulate and evaluate the microemulgel containing phytoconstituent for the treatment of hyperpigmentation and wrinkling additionally, to enhance the human appearance and skin moisturizing effect. Ascorbic acid and aloevera were taken as phytoconstituents. Totally six formulation was developed using different concentration of cabapol and all the prepared products are evaluated for physical property, measurement of pH, homogeneity, spreadability, particle size, viscosity, stability study, thermal stability. Based on the evaluation parameters study code F6 was selected as best formulation which showed long term stability and has better consistency.

INTRODUCTION

Cosmetics are any article intended to be rubbed, poured, sprinkled or sprayed or introduced or applied to human body or any part for cleaning beautifying, promoting attractiveness or altering the appearance. Cosmetic products are used to protect the skin against exogenous and endogenous harmful agents and improve the beauty and attractiveness of skin. The cosmetics products are best choice to reduce the skin disorders such as skin aging, skin wrinkles, hyperpigmentation and rough skin texture etc[1]. Microemulgel is considered as one of the promising technologies among novel drug delivery system due to its dual mechanism via emulsion and gel.

Aloevera is one of the most widely used botanicals. Aloevera reduces inflammation enhances wound healing increases collagen synthesis help to treat wrinkles and has antioxidant property reduces wrinkles. Wrinkles are a natural part of aging process. Hyperpigmentation is a harmless condition in which patches of skin get darker than the surrounding skin .It occurs when special cells in the skin make too much of pigment called melanin. Hyperpigmentation may appears as freckles, age spots or larger areas of skin get darkened [2,3]. Considering all these factors the study aimed to formulate microemulgel containing aloevera and ascorbic acid to manage wrinkles, hyperpigmentation and to provide moisturization.

MATERIALS AND METHODS

Materials

Aloevera, ascorbic acid**,** carbopol 934, liquid paraffin(oil phase), tween 20 and span 80 (emulsifier), propylene glycol(humectant), methyl paraben (preservative), lemon oil(fragrance), triethanolamine, were used in the manufacture of the microemulgel.

Methodology[4,5]

Preparation of Gel:

The gelling agent carbapol 934 was added in the water, the methyl paraben was dissolved in water and added to it. Aloe extract was added to the dispersion and triethanolamine was added in drop wise to form a gel. It was stirred continuously in mechanical stirrer to swollen completely.

Preparation of Microemulsion:

The Tween 20 was dissolved in water to prepare the aqueous phase of the emulsion, propylene glycol was added to the aqueous phase. Span 80 was dissolved in liquid paraffin to prepare the oil phase of the emulsion. The ascorbic acid was dissolved in the oil phase. Aqueous phase was dissolved in drop wise to the oil phase with continuous stirring using magnetic stirrer to form microemulsion.

Preparation of microemulgel:

The microemulsion and gel were mixed in 1:1 ratio to form microemulgel.

Table 1: Formulation of Microemulgel

Sl no:	Ingredients	F1	F2	F3	F4	F5	F6
1	Vitamin C (Ascorbic acid)	1g	1g	1g	1g	1g	1g
2	Aloe vera	5g	5g	5g	5g	5g	5g
3	Carbopol 934	0.25g	0.35g	0.45g	0.55g	0.65g	0.75g
4	Liquid paraffin	2.50ml	2.50ml	2.50ml	2.50ml	2.50ml	2.50ml
5	Tween 20	0.50ml	0.50ml	0.50ml	0.50ml	0.50ml	0.50ml
6	Span 80	0.75ml	0.75ml	0.75ml	0.75ml	0.75ml	0.75ml
7	Propylene glycol	3.50ml	3.50ml	3.50ml	3.50ml	3.50ml	3.50ml
8	Methyl paraben	0.01ml	0.01ml	0.01ml	0.01ml	0.01ml	0.01ml
9	Lemon oil	0.5ml	0.5ml	0.5ml	0.5ml	0.5ml	0.5ml

EVALUATION OF MICROEMULGEL[6,7,8,9,10]

1. Physical Appearance

The physical parameters such as colour, odour, appearance and texture were observed.

2. pH Measurement

The pH of microemulgel was measured using digital pH meter.

3. Spreadability

The weighed quantity of microemulgel (0.5g) was sandwiched between two glass slides.100 gm of weight was placed on slides. The weight was placed on the slides for specific time

period of 10 sec. The weight was removed and then diameter of spread circle was measured at different points.

$$S=MxL/T$$

Where, S=Spreadability, M= Weight placed on the slides, T=Time in seconds

4. Homogenity

The developed formulations were tested for homogeneity by visual inspection after the microemulgel was filled in the container. The microemulgel was tested for its presence of aggregates and appearance.

5. Viscosity

The viscosity of microemulgel formulation was determined by Brookfield viscometer, spindle no:64 and speed at 60 rpm. The value of viscosity is displayed in form of cp.

6. Washability

The formulations were applied on skin and then is extend of washing with water were examined.

7. Stability study

The formulations were taken and kept at room temperature (30±2ºC) as well as refrigerator (4±2ºC) over a period of time.

8. *In-vitro* release study

The study was performed by modified Franz diffusion cell using dialysis membrane. Before carrying out the study membrane was kept in acetate buffer pH 5.5 for 24 hrs and it was mounted carefully between the donor and receptor chamber. 200 mg of microemulgel was weighed and spreaded on the membrane. 12ml of acetate buffer (pH 5.5) was place in receptor medium. Both receptor and donor compartment were kept in contact with each other and whole assembly was maintained at constant temperature of 32± 0.5ºC. Magnetic bead was used to stir the solution of receptor chamber. 1ml was withdrawn after specific time intervals and equal amount was replaced with fresh dissolution media. Sample absorbance

was calculated spectrophotometrically at 272 nm and percentage drug permeation was calculated. The same procedure is repeated with marketed drug product.

9. Particle size determination

The particle size of microemulgel formulations were determined by dynamic light scattering. Malvern Zetasizer. Sample preparation was done by diluting 0.1 ml microemulgel in distilled water that is dispersion medium.

10. Dilution Test

The dilution test was performed by adding water or oil to the emulsion. And the type of emulsion was determined based on its solubility in oil in water.

11. Zeta Potential

Zeta potential of microemulgel was determined by Zetasizer (Malvern).Samples were placed in clear disposable zeta cell and results were recorded. Before putting a fresh sample, cuvettes were washed with methanol and rinsed using the sample to be measured before each experiment.

RESULTS AND DISCUSSION

Physical Appearance

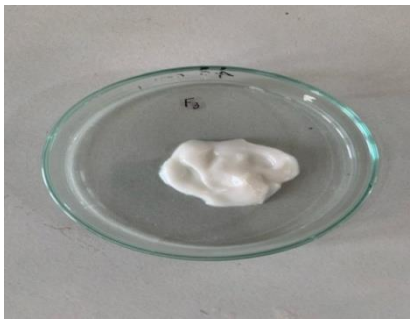

Fig.1 Microemulgel

The physical evaluation was done by testing the colour, appearance, consistency. Every formulated microemulgel was smooth and homogeneous and was lump free.

Table 2: Physical evaluation of emulgel.

Formulation code	Physical appearance	pH	Homogeneity
F1	White	5.56	Smooth and homogeneous
F2	White	5.66	Smooth and homogeneous
F3	White	5.68	Smooth and homogeneous
F4	White	5.65	Smooth and homogeneous
F5	White	5.67	Smooth and homogeneous
F6	white	5.55	Smooth and homogeneous

Table 3: Results of Viscosity and Spreadability

Formulation code	Viscosity (cps)	Spreadability (g.cm/sec)
F1	6529	15.1
F2	9538	16.3
F3	12830	17.2
F4	14720	17.6
F5	15456	18.3
F6	15325	19.1

Table 4: Particle Size and Zeta Potential

Formulation code	Particle Size (nm)	Zeta Potential (mv)
F1	143.51	3.13
F2	140.40	-2.51
F3	126.22	4.05
F4	123.50	4.18
F5	120.14	-3.45
F6	112.14	4.56

Table 5: In vitro Permeation Studies

Time (hrs)	Percentage drug diffused (%)						
	F1	F2	F3	F4	F5	F6	Marketed product drug
1	10.28	12.05	12.34	12.52	12.74	13.38	9.44
2	16.40	16.60	17.32	17.99	18.58	18.76	15.81
3	21.92	22.29	23.15	23.61	23.85	24.30	20.14
4	25.14	25.35	26.19	26.81	27.15	29.33	25.74
5	32.85	33.12	33.46	34.36	35.21	39.99	35.18
6	40.04	41.38	43.45	46.18	50.43	54.54	41.15

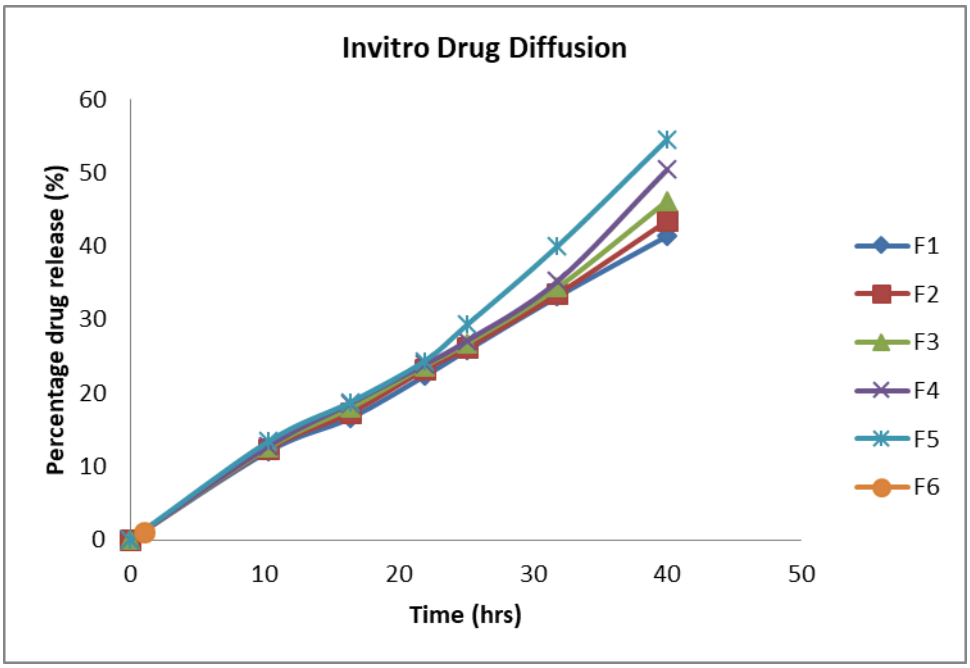

Fig.2 *In-vitro* diffusion study

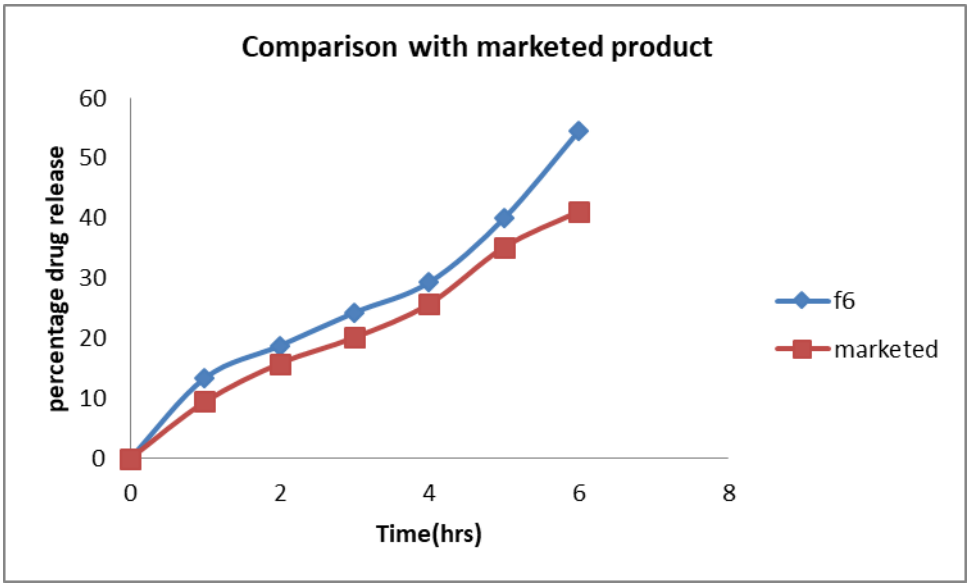

Fig.3 *In-vitro* diffusion study comparison with marketed formulation

Dilution Test

The dilution test was conducted by adding oil and water to the emulsion. The emulsion gets mixed with emulsion when oil was added to it, and the water does not mix with emulsion which indicated that the emulsion is water in oil type.

Washing Capability

The six formulations of microemulgel have good washing capacity. The applied microemulgel was easily removed by washing with tap water.

CONCLUSION

The Microemulgel one of the novel drug delivery system due to its dual mechanism of emulsion and gel. The reason behind choosing microemulsion system was its excellent capacity to solubilize and also its capability to permeate in to the skin and gel in the microemulsion help in the sustain release of drug. Totally six formulations were developed with the varying concentration of carbopol (934). The resultant microemulgel was water in oil type emulsion and all the formulations were gel consistency and non-sticky. The prepared microemulgel was evaluated for physical appearance, pH measurement, spreadability, homogeneity, viscosity, wash ability, stability study, in vitro release study, particle size determination, dilution test, zeta potential. F6 formulation was selected as best formulation based on drug content, viscosity and percentage drug permeation. Formulation F6 has maximum drug release, the F6 formulation is compared with marketed product and it shows that F6 formulation has more drug release than marketed product. Hence, it can be concluded that F6 is the best microemulgel formulation, prepared with aloevera and ascorbic acid which can be a used to treat wrinkling, hyperpigmentation and to provide moisturization to skin.

REFERENCES

1. Patravale VB and Bachhav YG. Clotrimazole vaginal gel made from a microemulsion: formulation, in vitro testing, and stability tests. Aaps Pharm. Sci. Tech. 2019;10:476-481.
2. Flanagan J and Singh H. Microemulsions: A Potential Delivery System for Bioactives in Food. Critical Reviews in Food Science and Nutrition. 2016;46(2):221-237.
3. Ashara KC, Paun JS, Soniwala MM, Chavda JR, Mendapara VP, and Mori NM. Microemulgel is a useful technique for enhancing the therapeutic efficacy of drug moiety. Pharmacy Journal. 2014; 24: 452-457.
4. Vats S, Saxena C, Easwari TS, and Shukla VK. An innovative method for improving the topical administration of hydrophobic medicines is the emulsion-based gel technique. Int. J. Pharm. Res. 2014;3: 649–660.

5. RB Patel, MR Patel, KK Bhatt, and BG Patel. For the transnasal administration of carbamazepine, formulation consideration and characterisation of microemulsion drug delivery system. Cairo University's Faculty of Pharmacy Bulletin. 2013; 51: 243-253.
6. Sharma PK, Kumar A. Celecoxib microemulsion for topical delivery: development, characterisation, and evaluation. J Dis Sci Tech, 2012;33:1411–1418.
7. Nastiti CM, Ponto T, Abd E, Grice JE, Benson HA, and Roberts MS. Skin delivery with topical nano- and microemulsions. Pharm., 2017;9:37-43.
8. A Review on microemulgel as topical drug delivery system by Tooba Nikhat, Sagar Kasar 2023,12(12),733-752
9. Formulation and Evaluation of Topical microemulgel containing Tolnafate by Sidharth Verma Mohammed Mujahid 2023,5(12),31-40
10. Formulation and Evaluation of embellin emulgel for topical delivery by Mahendran Sekar,Nur Asyikin Ismail2020,13,(1),60-64.