FORMULATION AND DEVELOPMENT OF MOISTURIZING REJUVENATING GEL WITH GEL WITH MATRYXYL 3000 USING MICROSPONGE TECHNOLOGY

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A B S T R A C T

Topical drug delivery system has many disadvantages like skin irritation, poor permeability, allergic reaction etc. The newly developed microsponge delivery system has the potential to overcome these problems. Microsponge are uniform, spherical, porous polymeric microspheres having particle size range 5-30µm. Microsponge formulations are compatible with most vehicles and ingredients, microsponge technology can be used in various cosmetic products like antiaging products, antiacne, antiblemish products, facewash etc. Gels are transparent and translucent non-greasy semisolid preparation that absorbs more efficiently to the targeted sites to deliver active ingredients into your skin.

The motive of this study is to formulate moisturising rejuvenating gel with matryxyl 3000 using microsponge technology and it's evaluation at different parameters.

Keywords: microsponge technology, Matryxyl 3000, Moisturizing rejuvenating gel, Evaluation of gel

1.Introduction

Moisturizing rejuvenating gel is a rich moisturizer formulated to address the special needs of dry skin. It is blend of emollient, humectants and vitamins which not only hydrates and nourishes your skin but also helps keep dryness from returning for a more youthful skin looking complexion[4]. Gel is non-greasy, non-tacky, and fast absorbing preparation. Oil in water emulsions based on polymer-stabilized lamellar gel networks are the dominant product form due to superior skin feel and moisturizing performance. The market is broadly divided into hand and body products and facial moisturizers are really positioned as moisturizers but more as anti-aging products due to line/wrinkle reduction, and increased skin firmness and elasticity claims[3].

Rejuvenating products that are creams, lotion, and gel are moisturizer based cosmoceutical. They deal with various signs of ageing include wrinkle, roughness of skin, loss of skin, sagging, loss of elasticity, dullness of face etc. These changes occur in skin after 30 yrs. age. Rejuvenating skin care products are very popular in skin care industry since them deals with all signs of ageing skin[4]. Rejuvenating means make look younger again, restore to youthful strength, appearance etc. Therefore it deals with all these signs of ageing and makes feel people to look younger. And hence these products are very popular and many people will to use them. first we will see moisturization of skin[4].

1.1 Moisturization[6]

Dry skin characterized by the sensation of tightness with the skin feeling rough and scaly and visible line developing. The major factor responsible for dry skin can be related to loss of water from stratum corneum. Stratum corneum must have the water content of 10-20% to maintain its normal functioning and healthy condition of the skin. If water content of stratum corneum lowers down, then skin becomes harden, causing cracking and peeling. The loss of moisture from the stratum corneum

is responsible for causing the dry skin. Moisturizer

The functioning of skin and mechanism are upset by changes in the environment and ageing. There are two basic reasons for dry skin.

1. First is due to prolong exposure to low humidity and air movement which modifies the normal hydration gradient of the stratum corneum.
2. The second is due to physical and chemical changes due to processes such as ageing.

For the purpose of moisturizing the skin, the water or humectant oil balance is extremely important and these two component exhibit complementing function in the respect. Moisturizer can smooth down desquamating corneocytes and filling gap between remaining corneocytes to create impartation of tactile-environment for heating and minimizing the appearance of lines of the dehydration by decreasing Trans epidermal water loosed (TEWL). Continuous and prolonged immersions of soap or detergent solution may contribute to dryness of the stratum corneum. The aetiology skin lipids, the horny layer lipids and the dissolution of the hygroscopic water soluble components in the stratum corneum.

1.2 Microsponge Technology[11]

The Microsponge Delivery System (MDS) is a unique technology for the controlled release of topical agents and consists of macro porous beads, typically 10-25 microns in diameter, loaded with active agent. When applied to the skin, the Microsponge releases its active in-gradient on a time mode and also in response to other stimuli (rubbing, temperature, pH, etc.). Microsponge technology offers entrapment of ingredients and is believed to contribute towards reduced side effects, improved stability, increased elegance, and enhanced formulation flexibility. In addition, numerous studies have confirmed that microsponge systems are non-irritating, non-mutagenic, non-allergenic, and non-toxic. MDS technology is being used currently in cosmetics, over-the-counter (OTC) skin care, sunscreens and prescription products.

Microsponge are uniform, spherical, porous polymeric microspheres having myriad of interconnected voids of particle size range 5-300μm. These microsponges have the capacity to entrap a wide range of active ingredients such as emollients, fragrances, essential oils, sunscreens and anti-infective, etc. are used as a topical carrier system.3 Microspheres, averaging 25μm in diameter4 and embedded in the vehicle, act like microscopic sponges, storing the active drug until its release is triggered by application to the skin surface.

2. Experimental

2.1 Preparation Of Microsponge (Loaded With Matrixyl3000)

Various batches of loaded microsponge were prepared by using ethyl cellulose as coating material and dichloromethane as a solvent by quasi emulsion solvent diffusion method[11].

Procedure:

To prepare inner phase 1.5gm of ethyl cellulose was taken. Then ethyl cellulose was dissolved in 20 ml of dichloromethane. Then add matrixyl3000 as an active under ultra-sonication for 20 min until it was complete solution. 0.5 gm. of polyvinyl alcohol was taken in 100 ml hot water and solution was made to prepare the outer phase. After the outer phase was prepared, now the solution of ethyl cellulose and dichloromethane was poured into 100 ml of PVA solution by means of spring needle drop by drop, following 1 and half hour stirring. After that stirring was stop and the mixture was filtered by watt man‟s filter paper. The powder thus obtained was air dried and stored for analysis.

Although, the general procedure for the preparation of microspounge was same, but some variation in formulation condition have been obtained. The different parameters under study were.

- ☐ Concentration of stabilizer.
- ☐ Mode of mixing
- ☐ Time of ultra-sonication
- ☐ Concentration of ethyl cellulose

Various batches of microsponge of ethyl cellulose were prepared by varying the parameter under study, keeping the outer parameters constant. The batches were evaluated for particle size, yield and other characteristics.

2.2 Product Formulation And Development

2.2.1) Formulation of Gel

Table no.1: Formulation of loaded microsponge in gel

Sr no.	Ingredients	Quantity for 100%		
		G1	G2	G3
1	Carbopol 940	0.5%	0.75%	1.0%
2	Alkali	1.0%	1.0%	1.0%
3	Glycerine	5.0%	5.0%	5.0%
4	DMDM hydration	0.15%	0.15%	0.15%
5	EDTA	0.05%	0.05%	0.05%
6	Water	Up to 100	Up to 100	Up to 100
7	Microsponge with active	1	2	3

***Procedure*:** Carbopol was dispersed in 90% of water along with DMDM hydration, EDTA and allowed hydrate keeping overnight. Then stirring this carbopol slowly and add loaded microsponge then add glycerine and stirring is continuous up to complete dissolution of carbopol and microsponge finally add alkali (TEA) with mixing is carried gently to avoid aeration and adjust pH to 7[5].

Table no.2: Optimization of Incorporated Gel (Microsponge)

Sr. no.	Parameter	Formulation		
		G1	G2	G3
1	Appearance	+++	+++	+++
2	Colour	++	++	+++
3	Viscosity	+++	++	+++
4	Shine	++	++	+++
5	Feel	+++	++	+++
6	Spreadability	+++	++	+++

Abbreviation:
+ Poor
++ Good
+++ Satisfactory

From the above formulation G-3 was selected and thus further evaluation is carried out of G-3 formulation.

3. Evaluation[2,10]

3.1 Evaluation of Gel (in- vitro)

3.1.1) Determination of PH

The formulation of gel is meant for topical application so their PH should be similar to that of the skin. The skin has an acidic and the PH of skin gel as per standard should be range 4.5-6.5**.**

***Apparatus*:** pH meter, preferably equipped with glass electrode.

Procedure: Accurately 5±0.01 gm. of the gel weighed in 100 ml beaker. 45 ml of water was added and the gel was dispersed in it. The PH of the suspension at 27ºC was determined using the PH meter.

3.1.2 Determination of Viscosity

Apparatus: Brookfield viscometer

Procedure: The viscosity of gel was determined by spindle no. 4 using Brookfield viscometer then all the operating condition was set up. Then five reading were taken at different RPM, and average of these will be the final readings. Viscosity was measure directly at various RPM in cps.

3.1.3 Determination of Total Microbial count of Gel

Cosmetic do not need to be sterile, but they must be adequately preserved. When consumers use cosmetics they repeatedly challenge the cosmetics with micro- organism in saliva on dirty hands, in tap water. Microbial growth may occurs in cosmetics and toiletry product like cream, lotion and gel and many more are intended to be used as skin care preparation, hence they come in contact with skin directly. Hence it is very important that the cosmetics product must to free from microbial contamination, so that it will ensure safety product to be client. The cosmetics product must be safe and adequately preserved.

Apparatus: Test tube, petri dish, colony Counter, Autoclaves

Sterilization of raw material and apparatus:

Raw material used for preparation is enclosed in suitable container and shall be sterilized in the autoclave for 20 minutes. Apparatus shall be sterilized in the autoclave at a temperature of 122ºC and 1.05 kg/ cm^3 pressure for 20 minutes or in the hot air oven at 160ºC for an hour.

Procedure:

Melt sufficient number of soybean casein digest agar medium in test tubes in a hot water bath

and transfer while hot into constant temperature water bath maintained at 48 ± 2ºC. Weigh hand transfer aseptically 1 g of the sample to conical flask containing sterile 50 ml of dilute phosphate buffer at PH 7.2. Shake well. Pipette out 1 ml portion into three sterile dishes. Pour melted and cooled soybean casein digest agar medium over it and rotate the plates to mix thoroughly. Incubate the plate at 32ºC for 72 hrs. in an inverted position.

Determine the average number of colonies on soybean casein digest agar medium plates and multiply by 30, the dilution factor. This will be the number of micro- organisms per g of the sample.

3.1.4 Stability Study of Gel

The sample of gel was kept at 5ºC, room temperature, 45ºC.The changes in physical appearance, colour, feel etc. were studied.

3.2 Evaluation of Gel (in-vivo)

3.2. Determination of Moisturizing property by Corneometer

Corneometer is a device which is equipped with a moisture sensitive probe which is needed to determine the accurate moisture content of stratum corneum. Hence it plays important role in determining the moisturizing activity of product on stratum corneum after application on skin

Apparatus: Corneometer equipped with a probe.

Procedure: first clean the hand with soap and then dry it completely, then touch the probe on hand in order to note the initial reading of moisture of the skin then after applying gel on the skin and wash it. Then again note the reading by touching probe on the part of application of analysis of moisturizing activity of gel.

3.2.2Patch Test

Patch test was performing on sensitive part of skin e.g. Blend of elbow, pop-literal space of skin behind ears. The cosmetic was tested applied to an area of 1 sq. of the skin control patches where also be applied the site of patch was inspected after 24 hrs. There was no reaction, and then test was repeated once more on the same side. Still no reaction was there, and then the person may be taken as not hipper sensitive and product pass the tes

4. Results

Table no. 3: stability parameters of gel with active microsponge

Sr.no.	Days	Ph	Moisture content	Viscosity
1	0	6.9	26.7	44,355 cps
2	8	6.6	56.7	44,000cps
3	16	6.6	67.0	44,355cps
4	24	6.6	70.5	44,000cps

Table no. 4: stability parameters of gel with active microsponge

Sr. no.	Parameter	Result
1	Total microbial cunt	Passed
2	Appearance	transparent
3	Colour	Opaque
4	Spreadability	Very good
5	Patch test	
	a. immediately	NR
	after removal of	NR
	product	NR
	b. after 24 hours	
	c. after 48 hours	

Abbreviation:
NR-no reaction

5. Conclusion

From the present study it was concluded that microsponge act as carriers for matrixyl3000 in order to release active on time more and enhance its effectiveness and choosing the suitable vehicle plays an important role in formulating a rejuvenating effect. Entrapment of matrixyl3000 enhances the effect.

Out of three formulations active concentration of 3% was satisfied with all desired characteristic, to provide maximum effect; theses selected concentration used in gel resulting in greater anti-wrinkle effect of final product.

Also the moisturizing value was less in case of gel when used in different concentration. Formulation G-3 of Anti-ageing gel was found to be the best formulation showing good rejuvenating properties with adequate viscosity, PH and stability as compare to other product. It shows good thermal stability with control of microbial test and mainly it shows good result of anti-ageing. And hence this formulation was selected.

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