



Formulation and Development of Skin Cleansing Gel with Self Exfoliation

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ABSTRACT

The aim of present work was to study formulation and development of skin cleansing gel with self-exfoliation. The idea of formulation of self-exfoliating gel was conceptualized by observing that the products available in mass market were not so gentle on the skin surface when exfoliated. Hence, exfoliating gel with Carbomer 940 and Cetrimonium Chloride was formulated with its own unique self-exfoliation property with deep cleansing effect. Cetrimonium chloride was validated by physical and chemical methods like colour, odour, pH and appearance. Suitable gel base was formulated with various concentrations of Cetrimonium chloride and the formulations were evaluated for the functional parameters. Exfoliating gel thus prepared was subjected to stability study for parameters like- colour, odour and pH at different temperatures like at room temperature, at 45° C and at 4°C. Subjective evaluation of gel was carried out to study the functional parameters like ease of spreadability, self-exfoliating efficacy, cleansing effect, improvement in skin texture and irritancy on skin, on human volunteers. The study showed that exfoliating gel with 10% Cetrimonium chloride was the best formulation for self-exfoliation with deep skin cleansing effect and improvement in texture of the skin.

Key words: Cetrimonium chloride, Gel base, Self exfoliating, Cleansing of skin

I. INTRODUCTION

The Skin:

The skin is the largest organ of the body, with total area of about 20 square feet in adult. The skin protects us from the harmful effects of external environment, helps regulate body temperature and permits the sensation of touch, heat and cold[1]. Skin has three layers-epidermis, dermis and deeper subcutaneous tissue (hypodermis)[2]. Skin's epidermis produces fresh skin cells every day. They are pushed up by the arrival of newer cells to the top of the skin[3]. After which they are dead and supposed to flake off by themselves in a process called desquamation. Unfortunately, the procedure often doesn't reach its completion in some areas of the body; so dead cells cling on and pile up which results in thickening of skin[4]. The thickness of the skin cannot be seen, but can be observed and experienced with fingertips and nails. However, the thicker it gets, the more exfoliation it needs [5]. In addition to this there might be other routine ways through which skin

might get damaged such as environmental pollution, photo damage, improper diet, lack of cleansing and use of unnecessary chemicals[6].

Exfoliation:

As skin grows older, rate of cell turnover slows down dramatically. Majorly dead cells found on facial skin surface may result in fine lines and can make complexion dull and dead [7]. To remain healthy and of good appearance, the skin surface requires frequent cleansing to remove grime, sebum and other secretions, and dead cells [8]. Exfoliation has become one of the most dominant activities in skin care and is considered by many to be beneficial as it refreshes the skin and removes dead cells [9]. Proper exfoliation removes the barrier of dead skin cells clogging the skin and uncovers fresh new cells below. This opens the way for moisturizing products to penetrate more deeply into the skin, which makes them more effective. In short, a regular exfoliating routine will leave skin fresh and healthy [10].

II. SKIN CLEANSING GEL WITH NATURAL EXFOLIATION

Skin cleansing gel is a type of exfoliator, but include no conventional scrubs, micro-dermabrasions, AHA, peel, etc. The purpose of the skin cleansing gel with natural exfoliation is to exfoliate the dead skin without abrasive material, doesn't tingle skin like glycolic acid does, it is effective but gentle, and also provides a sense of achievement when we experience the dead skin coming off. The skin appears much more clear, translucent, smooth and soft without stripping its natural oil after each application [11].

Exfoliating gel:

In the present study Exfoliating gel with popular carbomer 940 and cetrimonium chloride was formulated to have its own unique self-exfoliation and good skin conditioning property. Easy to use, easy to formulate and mild exfoliation feel with deep cleansing effect are ideal characteristics of the formulae. Some benefits of the exfoliating gel includes unclogging of skin pores, removal of dirt, grime and extra sebum, it allows penetration of creams, lotions, and other similar types of all topically applied products to deeper layers of skin and maintain skin's health. And, a modest approach to formulate and develop a product which can be applied on skin regularly for removal of dead skin cells without using any harsh chemicals or physical exfoliating agents was the key objective during this project work.

III. CETRIMONIUM CHLORIDE

Cetrimonium Chloride is transparent liquid, with characteristic odor and it is soluble in water. It has a molecular formula- $C_{19}H_{42}ClN$. It is reported that it shows antimicrobial, emulsifying agent, preservative and surfactant. Its use level are 0.25 – 10 % for rinse off preparations [12,13].

IV. MATERIAL AND METHODS

Analysis of Cetrimonium Chloride:

Cetrimonium Chloride was procured for the present study from N V Organics Pvt. Ltd., Delhi., along with Certificate of Analysis. The procured sample was validated by performing tests, such as colour, odor, pH, Ash and solubility. The results are summarized in table no. 1.

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Sr. No.	Ingredient	Uses of ingredients	Quantity for 100g in Percentage (%)			
			Trial 1	Trial 2	Trial 3	Trial 4
1	Water (Distill)	Vehicle	70	78	85	65
2	Ethyl Alcohol	Astringent	20	15	10	10
3	Glycerin	Humectant	5	5	3	2
4	Propylene Glycol	Humectant	-	2	2	3
5	Propanediol	Humectant	-	-	2	5
6	Carbomer 940	Gelling agent	2	2	2	2
7	Ethyl LauroylArginate	Preservative	0.5	0.5	0.5	0.5
8	GlycerylCaprylate	Preservative	0.5	0.5	0.5	0.5
9	Cetrimonium Chloride	Neutralizer	2	5	7	10
	Total		100	100	100	100

Gel base was selected by taking different trials for base and self-exfoliating gel was formulated with four different concentrations of Cetrimonium chloride i.e. 2%, 5%, 7% and 10% and studied for having its own unique self-exfoliation property as well as good skin conditioning ability

Study of Functional parameters of Self Exfoliating Gel:

The Self exfoliating gel formulations were subjected to study the functional parameters like Consistency, Clarity, Exfoliation and Cleansing. The results are summarized in table no. 3.

Analysis of Gel base: All the Gel base formulations were subjected to study parameters like Spreadability, Tackiness and after use feel on the skin [14]. The results are summarized in table no. 4.

Accelerated Stability Study: The objective of accelerated stability studies is to predict the shelf life of a product by accelerating the rate of decomposition preferably by increasing the temperature. This information is then projected to predict shelf life or used to compare the relative stability of alternative formulations. This usually provides an early indication of the product shelf life [15]. In the present study after analyzing all the four formulations on the basis of functional parameters it was observed that formulation (Trial-4) with 10% concentration of Cetrimonium Chloride was giving satisfactory results. Hence, the Trial-4 was selected for further study of accelerated stability test (i.e. trial-4 was observed for Colour, Odor and pH changes at room temperature, at 45°C and at 40°C) and subjective evaluation [16]. The results are summarized in table no. 5.

Subjective evaluation: Self exfoliating gel containing 10% Cetrimonium Chloride (i.e. Trial 4) was given to 10 volunteers of age group between 19-30 years for 4 weeks to carry out the subjective evaluation on the basis of

their feed back. The subjects were asked to use exfoliating gel twice a week for 4 weeks and note the changes they observed on the surface area of the body where they applied the product. Subjective evaluation was carried out on the basis of rating (1-5) the parameters like Appearance, Ease of Spreadability, Self-Exfoliation efficacy, Improvement in skin Texture and Irritancy in skin.

V. RESULT AND DISCUSSION

Analysis of Cetrimonium Chloride:

Cetrimonium Chloride was analyzed; results were noted and compared with values mentioned in Certificate of Analysis of Cetrimonium Chloride. It passed all the tests and hence was used for incorporation in exfoliating gel formulations. The results are summarized in table no.1.

Table No.1: Analytical test results of Cetrimonium Chloride

Sr. No.	Characteristic	Requirement As Per Certificate of Analysis of Cetrimonium Chloride	Result	Inference
1.	Color	No Color	No Color	Passes the test.
2.	Odor	Characteristics	Characteristics	Passes the test
3.	Appearance	Liquid type	Liquid type	Passes the test
4.	pH	5.0-8.0	7.12	Passes the test
5.	Ash	0.1 Max	0.04	Passes the test
6.	Solubility	Water Soluble	Water Soluble	Passes the test

Study of Functional parameters of Self Exfoliating Gel:

In the present study after analyzing all the four formulations on the basis of functional parameters it was observed that formulation (Trial-4) with 10% concentration of Cetrimonium Chloride was giving satisfactory results. Hence, the Trial-4 was selected for further study. The results are summarized in table no.3.

Sr.No.	Formulations	Observed Parameters				Inference
		Consistency	Clarity	Exfoliation	Cleansing	
1	Trial1	Less Viscous	NotClear	Noexfoliation	Poor	Increased CetrimoniumChloride
2	Trial2	More Viscous	NotClear	Noexfoliation	Poor	Increased CetrimoniumChloride
3	Trial3	More Viscous	NotClear	Less exfoliation	Fine	Increased CetrimoniumChloride
4	Trial4	Satisfactory Viscous	Clear	Enough exfoliation	Good	Good

Table No. 3: Result of Selection of Gel with self-exfoliation

Analysis of Gel base: From the results of analysis of all the Gel base formulations (i.e. Trial-1,2,3,and 4)it was observed that Trial-4 was satisfactory with respect to Spreadability, Tackiness and After use feel on the skin, hence it was selected for further study. The results are summarized in table no.4.

Sr. No.	Parameters	Trial1	Trial2	Trial3	Trial4
1	Spreadability	Fine	Fine	Good	Good
2	Tackiness	Tacky	Tacky	Slightly Tacky	Non Tacky
3	After use feel on skin	Fine	Fine	Fine	Good

Table No. 4: Result of Analysis of Gel base

Accelerated Stability Study: From the result of accelerated stability study it was observed that the self-exfoliation gel with 10% concentration of Cetrimonium Chloride (Trial-4)was stable with respect to physical and chemical parameters like colour, odour and pHfor 30 days, and also the product was passed cyclic temperature test for 3 cycles.

Sr.No.	Characteristic	Requirement	Observation
1.	Cyclic temperature test	To pass the test	Passes the test
2.	Accelerated stability test		
	Colour,	To pass the test	Passes the test
	Odor	To pass the test	Passes the test
	pH	4-9	4.8

Table No. 5: Result of Chemical and Physical testing of self-exfoliation gel (Trial-4)

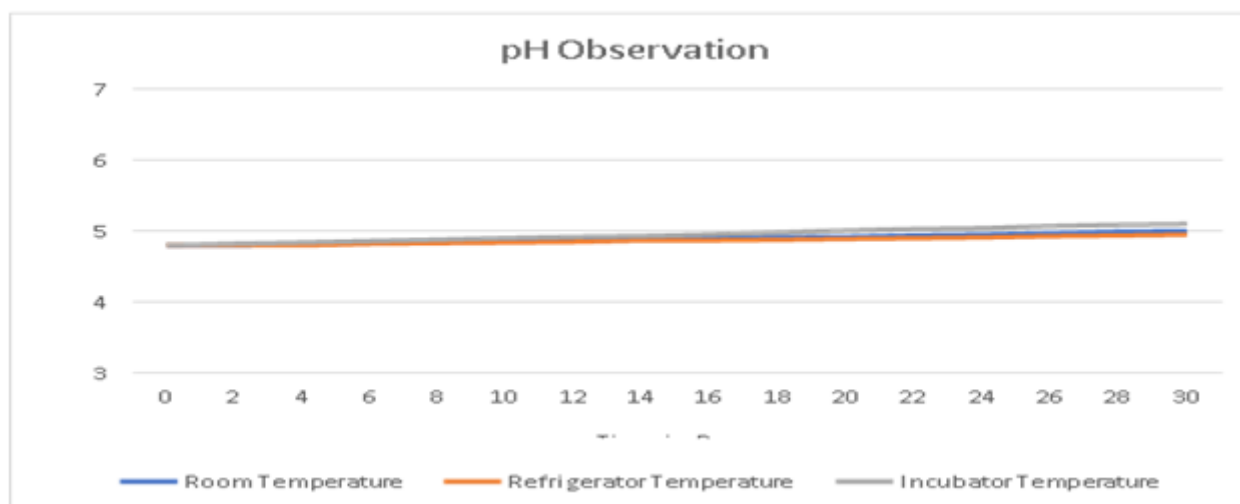


Figure no. 1: Change in pH at different Temperature (Accelerated stability test-Trial-4)

Subjective evaluation: From the subjective evaluation, it was observed that self-exfoliation gel (Trial-4)was well appreciated. It caused no irritation on regular application. It showed good self-exfoliation with deep skin cleansing effect and improvement in texture of the skin.

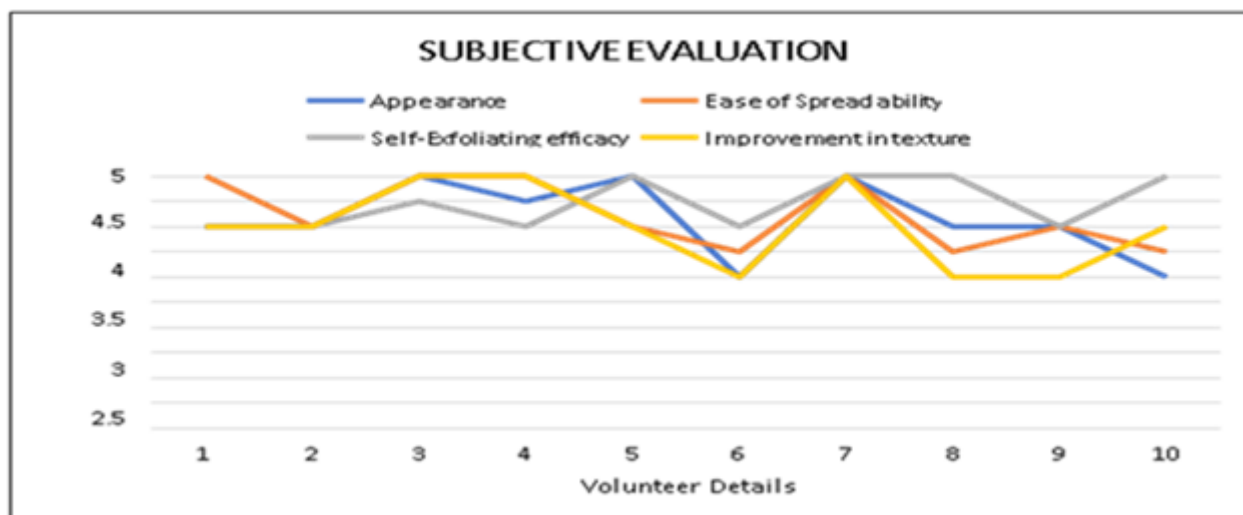


Figure No. 2: Graph of Subjective evaluation

VI. CONCLUSION

After formulating and evaluating the skin cleansing gel with self-exfoliation, it is observed that product can be a useful addition in the portfolio of other mild exfoliating products available in market. Being an indifferent approach in the theory of exfoliation, the gel can be efficiently used for removal of dead skin cells, without harming the skin.

VII. REFERENCES

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