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DEVELOPMENT OF COSMETIC LIPOSOMAL GEL

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კოსმეტიკური ლიპოსომალური გელის შემუშავება

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რეზიუმე

კოსმეტოლოგიის ერთ-ერთ აქტუალურ პრობლემას წარმოადგენს კოსმეტიკური საშუალებების მიზანმიმართული მიწოდების საკითხი, კერძოდ დერმალური ბარიერის გავლა და ბიოლოგიურად აქტიური ნივთიერებების მიწოდება ღრმა ქსოვილებში. ეს პრობლემა გადაიჭრა კოსმეტოლოგიაში ნანოტექნოლოგიების გამოყენებით. სწორედ ამ ტექნოლოგიებმა ჩაუყარა საფუძველი პროფესიული უჯრედული კოსმეტიკის განვითარებას.

მცენარეული მაღალმოლეკულური ნივთიერებების გამოყენებით მოწოდებულია ქვერცეტინის შემცველი ლიპოსომების რეცეპტურა; დამუშავებულია ქვერცეტინის ლიპოსომების მომზადების ტექნოლოგია და განსაზღვრულია მათი ზომები ელექტრონულიმიკროსკოპის გამოყენებით – 90-150ნმ. დადგენილია ქვერცეტინის ლიპოსომების შემცველი გელისშემადგენლობა და მოწოდებულია მისი მომზადების ტექნოლოგია; განსაზღვრულია ქვერცეტინის რაოდენობრივი შემცველობა და შესწავლილია გელის ძირითადი ტექნოლოგიური მახასიათებლები. დადგენილია, რომ მას გააჩნია დამაკმაყოფილებელი სტრუქტურულ–მექანიკური თვისებები, ამასთან მაღალია მოქმედი ნივთიერების გამოთავისუფლების ხარისხი.

Introduction: The main task of cosmetology is to develop the cosmetics with target delivery, namely to penetrate the dermal barriers and supply the biologically active compounds deeply in tissues [1]. The solution of the problem became possible after introduction of the nanotechnologies in cosmetology; and based on this new technology the development of professional cellular cosmetics is now available [2,3].

The aim of the work: The aim of the submitted work was to develop the antiaging liposomal gel, with target distribution ability**.**

To reach the envisaged aim was needed to solve the following tasks: reception of the basics from natural gel producer compounds (for example seeds of linen); the inclusion of the quercetin, as an antioxidant agent, in liposomal mixture; and development of the liposomal gel technology.

During the experiment was used the following methods: the microscopic analysis of developed liposomal gel; the quantitative determination of quercetin by UV-spectrometry; the liberation level detection of quercetin from the gel with diffusion method; rheological characteristics analysis of the product with viscosimeter.

To develop the natural gel, we used the water extract of Flax (*Linum usitatissimum*) seeds in following ratio 1:5 (v/v).

In experiment were used the classic method of liposomal systems reception, the main meaning of which is following: should be prepared the phospholipidic solution of some concertation with use of organic solvent with simultaneous addition of active substance. After evaporation of organic phase, the introduction dry residue into gel composition is followed.

At the first stage were selected the organic phase to prepare the phospholipidic solution. For that purpose, were used Ethyl alcohol of 70%, Ethyl alcohol of 95% and Chloroform. The study results are given in Table 1.

Table 1 **Solubility of Lecithin in Organic Phase**

Lecithin (g)	Solvent (10 mL)		
	Ethyl Alcohol 70%	Ethyl Alcohol 95%	Chloroform
0.2	Practically insoluble		
		Hardly soluble	
			Well soluble

In combination with lecithin were added quercetin, as an active substance. After evaporation of organic phase, the dry residue was introduced in already prepared by us Flax gel. This method gives us opportunity to receive multilayer liposomes, where the hydrophobic compounds do the mixture at the initial stage, and inclusion of hydrophilic agents are done from water layer.

The next stage was disintegration of multilayer liposomes by ultrasonic mixer (Ultra Turax T – **25** digital, 2000 rpm) and receive the liposomal mixture (Pic. 1)

Pic 1 Electromicroscopic Picture of Gel

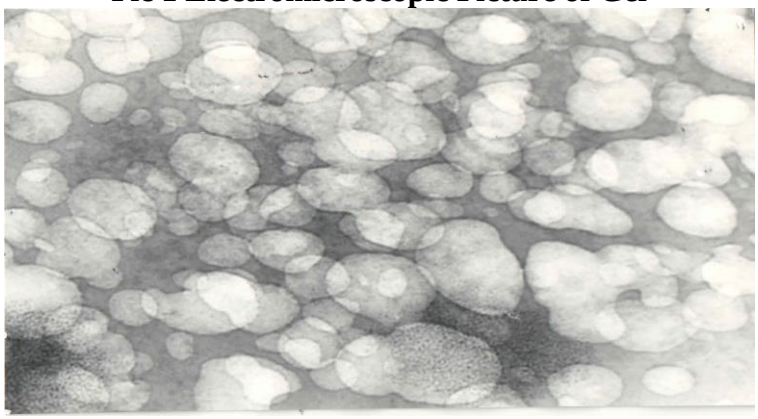


Table 2. Liposomal Gel Content (g)

Flax seed gel	Lecithin	Chloroform	Quercetin	Vitamin		Sodium Benzoate
				A	E	
75	1.5	17,5	0.1	2.45	2.45	1

As a result of conducted study was selected the optimal composition and technology; was developed the method of quantitative analysis of quercetin in gel; and microscopic picture of the gel shown the homological liposomal structure of the product. Developed manufacturing process of liposomal gel: Reception of flax seed gel; Reception of lipid suspension; Introduction of lipid suspension in gel; Addition of vitamins and preservatives; Emulsifying the gel; Standardization.

The quality control of the developed gel was done by some tests: were determined the pH of developed liposomal gel by pH-meter and it was 5.6.

Also, was tested the quercetin release rate by disk-diffusion agar method. The dimeters of coloured zones of released active ingredient is given in Table 3.

Table 3. The dimeters of released active ingredient's coloured zones tested by disk-diffusion agar method

Product	Dimeter of coloured zones (mm)		
	1 hrs	2 hrs	3 hrs
Flax seed's liposomal gel	10	10	11

The mean error was calculated by following formula:

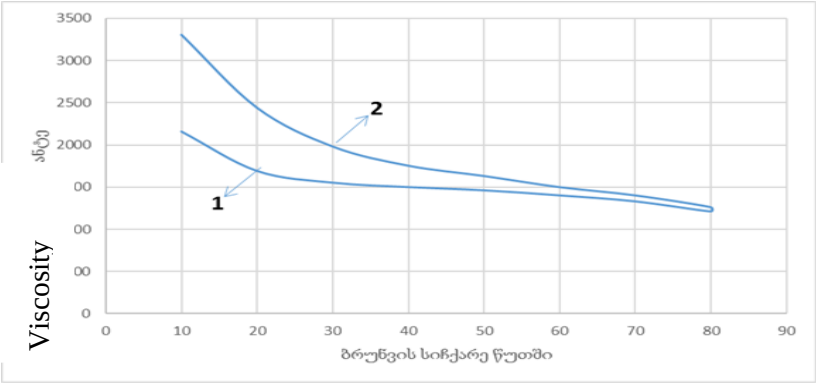
$$m = \pm \varepsilon a k$$

where: m – mean error; ε - sum; a - deviation dimeter; k – index (the value depends on number of done analysis- n =3 k=0.29004) The data can be found in Table 4.

Table 4. Determination of active ingredient release rate by disk-diffusion agar method

Product	Dimeter deviation index (a)	d_{mean}(mm)	Mean error(m)
Flax seed's liposomal gel	1.3	10.3±0.38	0.38

Gel viscosity was tested by viscosimeter SNB 2



Rotation speed

Final test was quantitative determination of quercetin in gel by UV spectrometry on 415 nm of wavelength.

The determination of sum of flavonoid aglycones in % calculated by quercetin amount by following formula:

$$X = \frac{D \times 50 \times 50 \times 25 \times 100}{M \times 20 \times 10 \times 485 \times 100}$$

Where:

- D - optical density of sample solution and is mean value 0.9862
- 485 - specific absorption rate at 415 nm.
- M - sample weight

Based on calculations done by above mentioned formula the sum of flavonoid aglycones calculated on quercetin is 0.152%.

Conclusion

Were developed the composition of liposomal gel, its technology and studied the quality control indexes such as: pH =5.6 (N 5.2-5.7), active ingredient release rate by disk-diffusion agar method**,** rheological characteristics – viscosity and in the product was determined the flavonoid sum, which is 0.152%. By help of electronic microscope was taken the picture to study the developed liposomal gel structure.

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РАЗРАБОТКА КОСМЕТИЧЕСКОГО ЛИПОСОМАЛЬНОГО ГЕЛЯ

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Резюме

Одной из актуальных проблем косметологии является преодоление кожного барьера и доставка биологически активных веществ в глубокие слои ткани. Эта проблема была решена после того, как стало возможным использование нанотехнологии в косметологии. Именно использование этих новых технологий заложила основу для развития профессиональной клеточной косметики.

Предложена рецептура косметического геля, на основе высокомолекулярных веществ семени льня содержащих липосомы лецитина с кверцетином. Размеры липосом кверцетина определили с помощью электронной микроскопии. По оценкам, их размеры составляют от 90 до 150 нм. Определен состав геля, содержащего липосомы кверцетина и предложена технология его приготовления; Определено количественное содержание кверцетина и изучены основные технологические характеристики геля. Установлено, что он имеет удовлетворительные структурно-механические свойства, с высокой степенью высвобождения действующего вещества.

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SUMMARY

One of the urgent problems of cosmetology is overcoming the skin barrier and the delivery of biologically active substances into the deep layers of the tissue. This problem was solved after the use of nanotechnology in cosmetology became possible. It was the use of these new technologies that laid the foundation for the development of professional cellular cosmetics.

A formulation of a cosmetic gel based on high molecular weight substances of flax seed containing liposomes of lecithin with quercetin has been proposed. The sizes of quercetin liposomes were determined using electron microscopy. Their sizes are estimated to range from 90 to 150 nm. The composition of the gel containing quercetin liposomes has been determined and the technology for its preparation has been proposed; The quantitative content of quercetin was determined and the main technological characteristics of the gel were studied. It was found that it has satisfactory structural and mechanical properties, with a high release of the active substance.