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Formulation and Investigation of Gels Containing Spirulina Powder

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Keywords: *Gels, polymers, spirulina, HaCaT, MTT*

1. Introduction

The use of materials of natural origin for medicinal purposes has a history of hundreds of years. At least 80 percent of patients are treated with natural agents, according to a World Health Organization (WHO) survey. Also, in developed countries, about 40% of medicines used are from natural sources.

Algae have been an important nutritional component. They are rich in nutrients and minerals important to the human body. Spirulina alga has long been used internally as a dietary supplement and externally as well.

The aim of this study was to present the formulation of the gels containing Spirulina powder. Cell viability assay, texture analyzing and diffusion test with the different compositions were carried out and compared to each other.

2. Materials and methods

Formulation of gels

first we prepared the base gels by adding the right amount of polymer (Noveon, Carbopol, Pemulen) to the specified amount of water and then starting the gelation process with the addition of Trolamine. The active ingredient was suspended with gel. Each gel composition contained Spirulina powder in 0.5%.

Examinations

the cytotoxicity of Spirulina was determined using a colorimetric MTT assay on HaCaT cell line.

Texture analyzing test was carried out with Brookfield CT3 Texture Analyzer.

In vitro diffusion studies were performed using Franz diffusion cells and cellulose acetate synthetic membranes.

3. Results

Cell viability assay

after performing colorimetric MTT cytotoxicity assays on HaCaT cells, gels of 0.5%, 0.1% and 0.01% were found to have the lowest cytotoxicity (***Figure 1***). This provided adequate information on the cytotoxicity of Spirulina powder. A concentration of 0.5% was chosen for further studies.

Texture analysing

both for compression and tension measurements the Carbopol 974P gel required the highest force. This value is approximately 2290 N, while in the case of tension measurements it was 1270 N. The smallest effort required by the Noveon AA1 Polycarbophyl. In this case, the value obtained during compression measurement is 1225 N and during tension measurement a force of 520 N was required.

Franz diffusion studies

The Franz diffusion cell can be used to reproduce

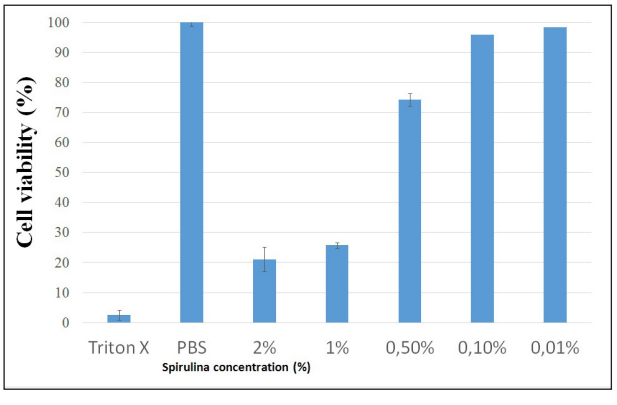

Figure 1 *Results of the cell viability test. Triton X and PBS were used as positive and negative controls*

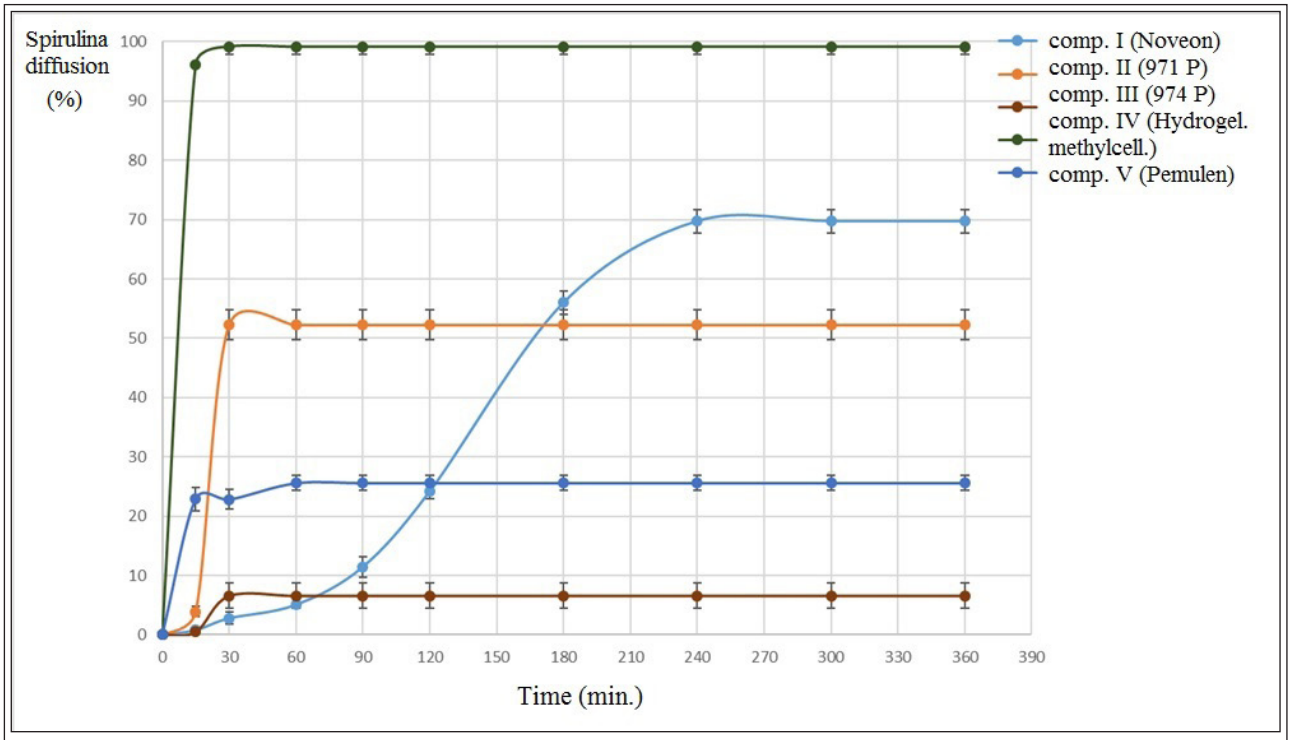

Figure 2 *Results of the cell viability test. Triton X and PBS were used as positive and negative controls. Viabilities of the cells treated with test solutions were compared to the negative control group.*

the penetration of active ingredient through the skin from various compositions. The determination of Spirulina content of the samples taken at given intervals is based on the absorbance measured with UV-VIS spectrophotometer at 270 nm wavelengths. The average of the results (total amount of diffused Spirulina) obtained is shown in ***Figure 2***.

As shown in the summary graph of the results, the gel composition with the most uniform transmembrane diffusion is the Noveon AA1 Polycarbophyl polymer containing gel. The fastest drug release was observed in the case of formulation containing Hydrogelum methylcellulosi (Ph. Hg. VII.). The worst membrane penetration obtained with the gel composition containing Carbopol 974P polymer.

4. Conclusions

The aim of our experimental work was to formulate Spirulina containing gels. The active ingredient was formulated into a gel by varying the gelling agent in the composition. In vitro cell viability assays determined the appropriate concentration of Spirulina powder in the gel composition. Based on the formulation studies, the appropriate gelling agent was selected. The consistency of the gels was investigated with Texture Analyzer and the release of the active ingredient from the vehicle was determined using Franz diffusion cell.

5. Acknowledgements

The published work was carried out under the project Debrecen Venture Catapult (EFOP-3.6.1-16-2016- 0002). The project is supported by the European Union, the Co-funded by the European Social Fund.

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