DEVELOPMENT OF INNOVATIVE LIPOSOME-RELEASE SYSTEMS FOR ENCAPSULATION OF BIOLOGICALLY ACTIVE SOYBEAN PEPTIDES

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UNIFOOD CONFERENCE
September 24-25 2021.
University of Belgrade

Introduction

It is generally known that protein hydrolysates have specific bioactive properties such as antioxidant, antihypertensive, antidiabetic activity etc. However, lower digestibility, decreased absorption, potential allergenic and bitter taste might lead to a limited use of protein hydrolysates as a component of functional food [1].

Moreover, loss of biological activity in the gastrointestinal tract before the desorption in the bloodstream may occur, leading to bioactivity deficiency on the target place.

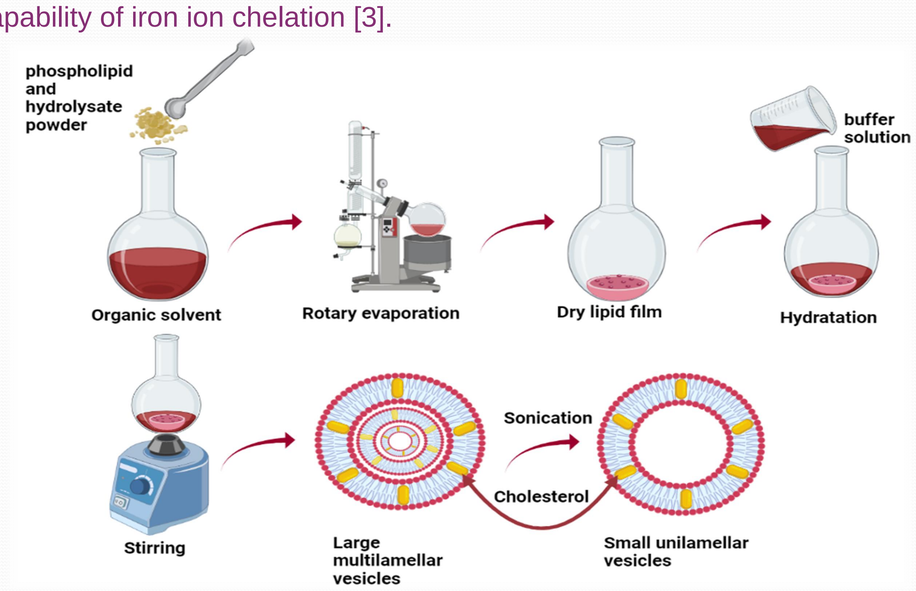
Encapsulation of proteins and their hydrolysates is one of the emerging techniques for overcoming the above mentioned disadvantages. Liposomes, consisting of natural phospholipids, which are the building blocks of cell membranes, are the most suitable choice for encapsulation [2].

Aim of this study is the potential liposome application as a carrier for encapsulation of bioactive peptides. Using liposomes for protein encapsulation allows their biological activity to be left intact, introducing advanced and widened application.

Methods

Multilamellar vesicles are obtained by a thin-film method, shown in scheme 1. The influence of the soy peptide mass on the encapsulation efficiency, stability, particle size distribution and polydispersity index was examined.

Furthermore, the added cholesterol contributed to an increased encapsulation efficiency, distribution and stability of the obtained vesicles. Controlled release of encapsulated peptides were examined in two fluids: simulated gastric (SGF) and simulated intestinal (SGF) fluids. The antioxidant activity is assessed in all samples by measuring the reduction capacity of ABTS•+ radical cation, and the capability of iron ion chelation [3].



Sheme 1. Schematic illustration for the preparation of liposome by thin -film method

Conclusion

According to the results, it can be concluded that the addition of cholesterol is justified regarding to all encapsulation parameters.

The encapsulation efficiency increases with the increase of the soy peptide mass, where it can be seen that the most uniform distribution is achieved in the sample with the highest peptide mass.

All samples have a negative value of the zeta potential, where an increase of the negative charge above 30 mV is noticed in the samples containing cholesterol and higher peptide mass (60 and 100 mg).

The antioxidant activity was kept after the liposome encapsulation in all samples. It is proved that liposomes allowed prolonged release of peptides with antioxidant activity in a simulated gastrointestinal system.

The results indicate that the liposomes as an encapsulation system of bioactive soy peptides can be applied for preparation of food products.

Results

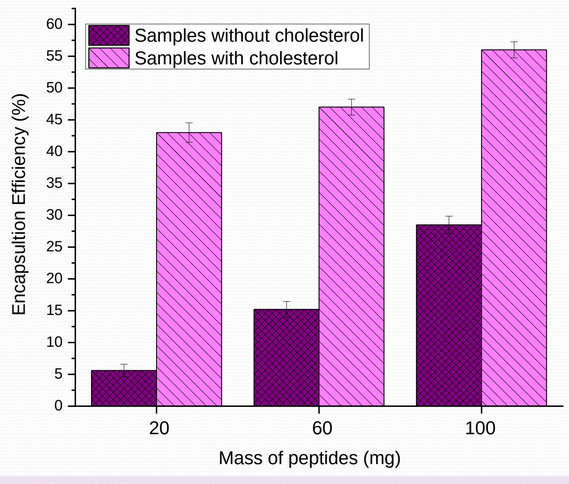


Figure 1. Effect of different initial mass of soybean peptide on encapsulation efficiency

Table 1. Liposome diameter size and polydispersity index at different initial mass of soybean peptide

	Samples with cholesterol		Samples without cholesterol	
Mass of peptides, mg	Particle size, nm	Poly Dispersity Index	Particle size, nm	Poly Dispersity Index
20	286.7	0.392	346.1	0.412
60	179.2	0.308	456.4	0.471
100	191.1	0.266	436.2	0.438

Table 2. Antioxidant potential of liposome at different initial mass of soybean peptide

Antioxidant potential	Samples with cholesterol		Samples without cholesterol	
Mass of peptides, mg	ABTS, %	Metal ion activity, %	ABTS, %	Metal ion activity, %
20	35.0	26.0	7.50	7.00
60	38.0	28.3	14.3	12.2
100	44.8	32.8	21.1	19.4

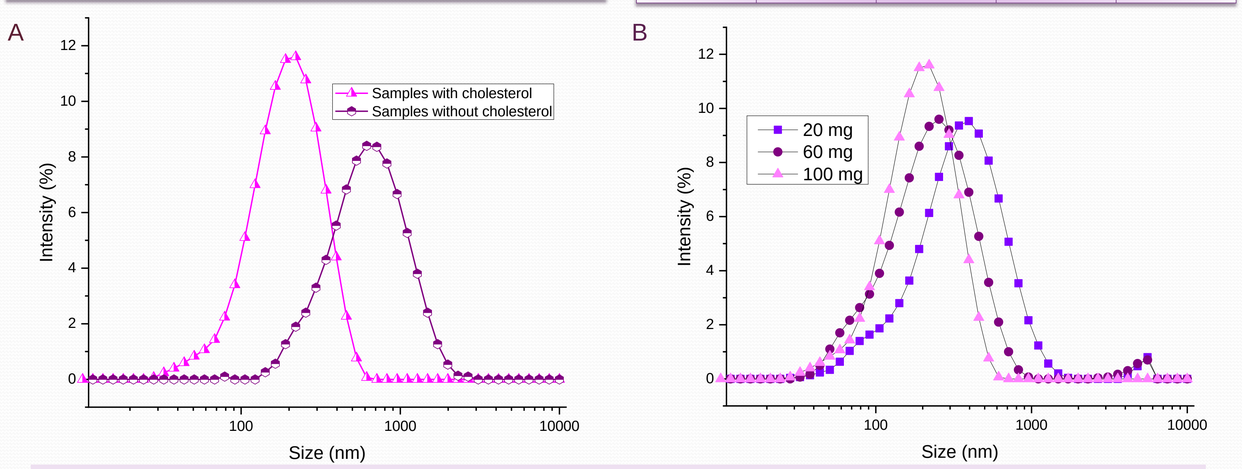


Figure 2. Size distribution of liposomes: the effect of cholesterol addition at 100 mg peptide (A) and the effect of different initial mass soybean peptide with holesterol addition (B)

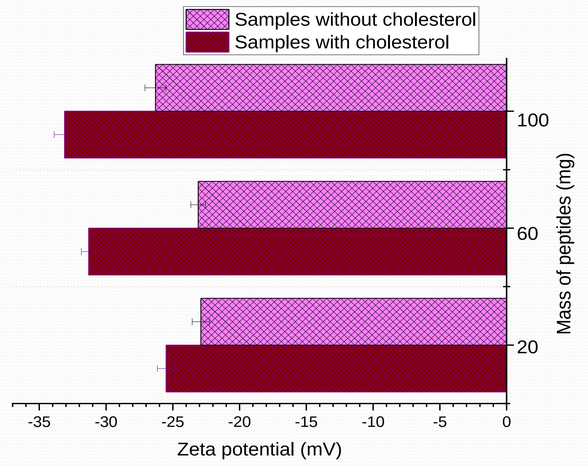


Figure 3.Zeta potential of liposome at different initial mass of soybean peptide

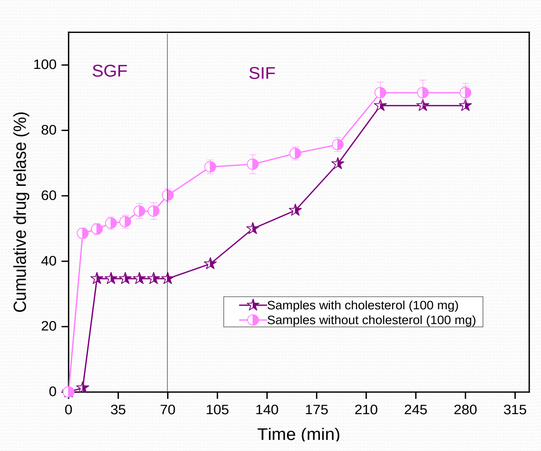


Figure 4. Controlled relase of soybean peptide from liposome

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Aknowledgment

The authors are grateful for financial support from the Ministry of Education, Science and Technological Development of the Republic of Serbia (Contract No. 451-03-9/2021-14/200135 and Contract No. 451-03-9/2021-14/200287).