

SOY LECITHIN-BASED LIPID NANOCARRIERS FOR THE DELIVERY OF *Cannabis sativa* EXTRACT WITH PHOTOPROTECTIVE ACTIVITYMarcos E. Farías^{1*}, Luis Felipe Velasco Berrio², Silvana Binotti¹, Patricia G. Molina², M. Alejandra Luna².¹ Department of Molecular Biology, Faculty of Exact, Physical-Chemical and Natural Sciences - Institute of Environmental and Health Biotechnology, National University of Río Cuarto - National Council for Scientific and Technical Research, Río Cuarto, X5800, Argentina.² Department of Chemistry, Faculty of Exact, Physical-Chemical and Natural Sciences - Institute for Agroindustrial and Health Development, National University of Río Cuarto - National Council for Scientific and Technical Research, Río Cuarto, X5800, Argentina.

*mfarias@exa.unrc.edu.ar

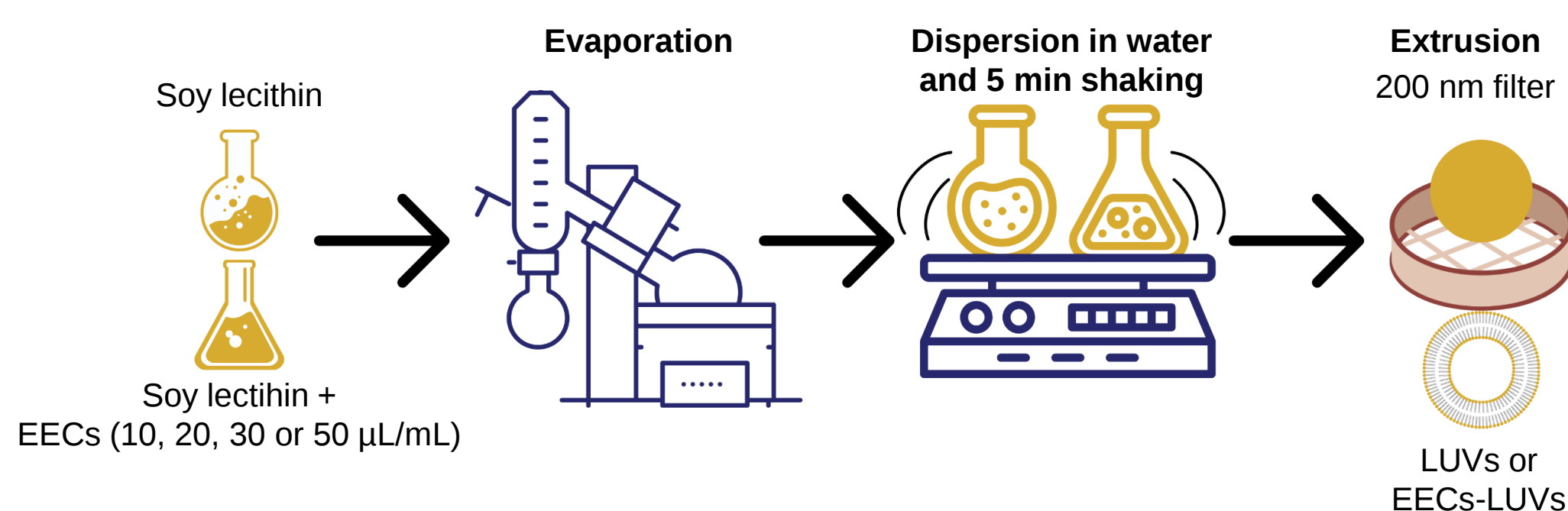
INTRODUCTION & AIM

Vesicles are supramolecular structures formed by self-assembled bilayers of surfactants in aqueous solution. These structures are used as carriers for biologically active molecules delivery, as they can enhance the solubility and bioavailability, and increase cellular uptake of certain drugs.

Cannabis extracts are known for proven therapeutic and antioxidant properties, although the low water solubility limits its use in aqueous formulations. On this basis, the aim of this study was to evaluate the incorporation of a chemotype III full-spectrum ethanolic extract of *Cannabis sativa* (EECs) in large unilamellar vesicles (LUVs) and determine the biocompatibility and photoprotective effect of the encapsulated extract.

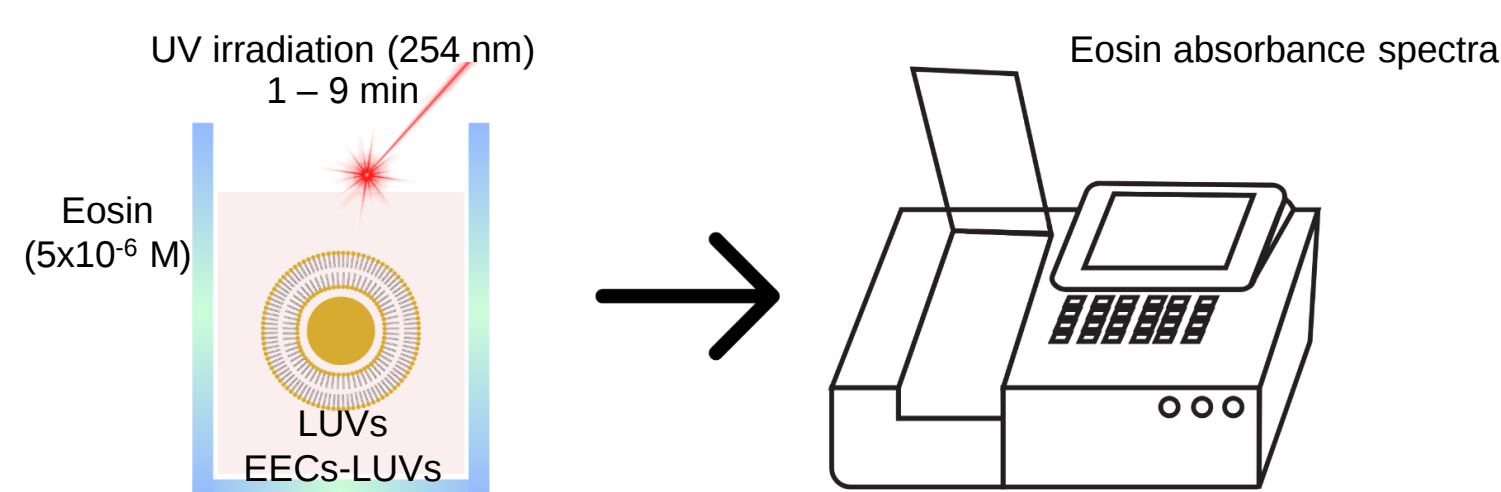
METHOD

1- Vesicles preparation. Soy lecithin LUVs (LUVs) and EECs-loaded LUVs (EECs-LUVs) were prepared by the extrusion method :



2- Size and ζ potential measurements. Zetasizer Nano S from Malvern Instrument Ltd. was used at 25 °C. CONTIN was used as the algorithm to obtain the hydrodynamic diameter values

3- Photoprotective effect evaluation. Eosin solutions in the presence and absence of LUVs and EECs-LUVs were irradiated with UV light. Eosin degradation was monitored using UV-visible spectroscopy:¹



4- Hemolytic effect of EECs-LUVs: Human blood samples were incubated with LUVs, EECs or EECs-LUVs for 2 h at 37°C. Hemolysis was calculated measuring the absorbance of the released hemoglobin compared to a negative control.

RESULTS & DISCUSSION

1- Vesicles characterization:

Vesicle	Diameter (nm)	PI	ζ potential
LUVs	145	0.09	-64,5
EECs-LUVs (50 µl/mL)	146	0.16	-67,7

Table 1: Determination of hydrodynamic diameter, polydispersity index (PI) and ζ potential of LUVs and EECs-LUVs.

CONCLUSION

These findings demonstrate that EECs-LUVs are biocompatible and represent a potential carrier for *Cannabis* extract. Moreover, they confirm the photoprotective effect of the encapsulated extract, suggesting applications in the development of new formulations that enhance stability under UV radiation and preserve other sensitive compounds within the matrix.

2- EECs encapsulation:

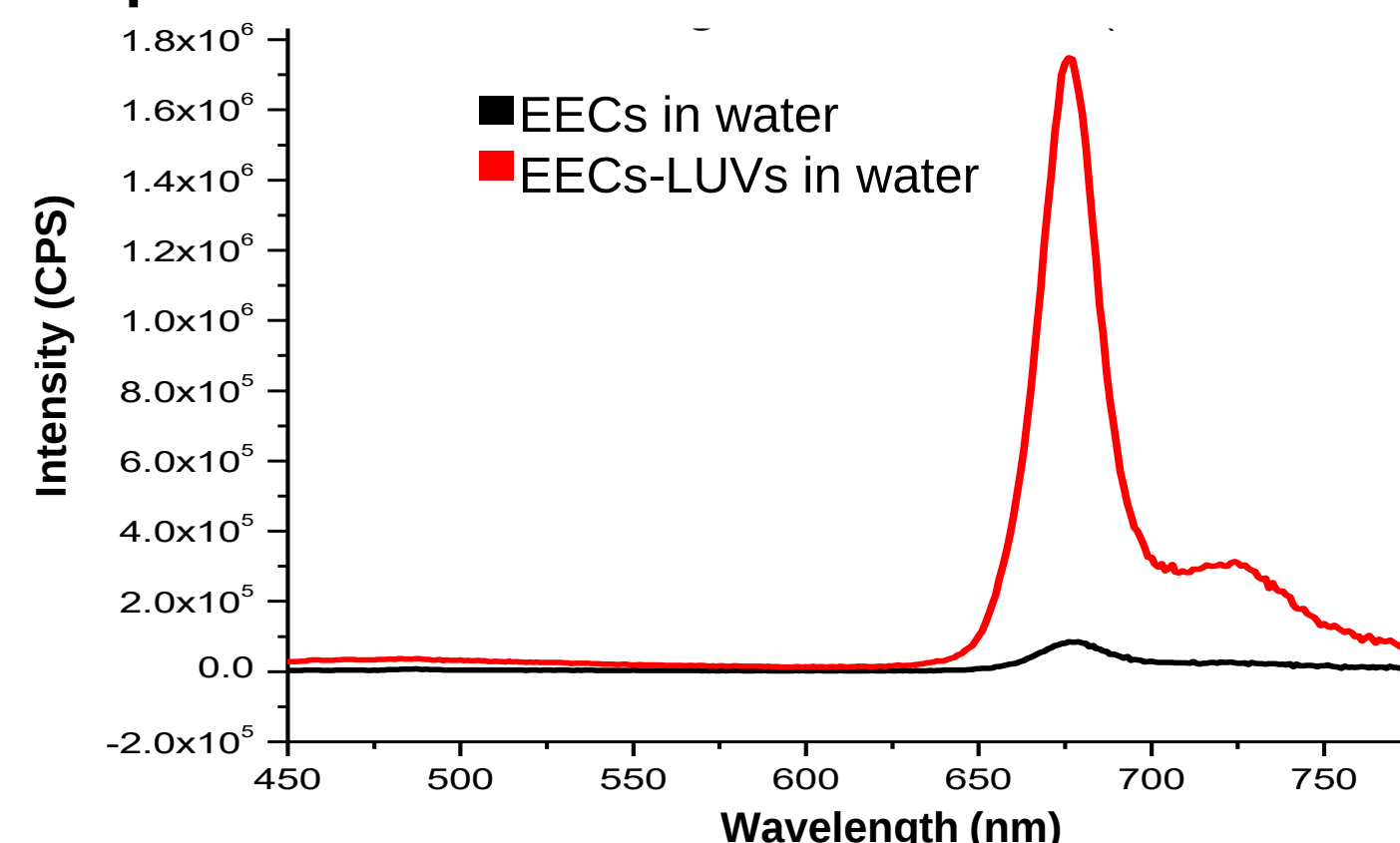


Figure 1: Emission spectra (λ_{exc} = 412 nm) of EECs and EECs-LUVs in aqueous solution

3- Photoprotective effect of EECs-LUVs:

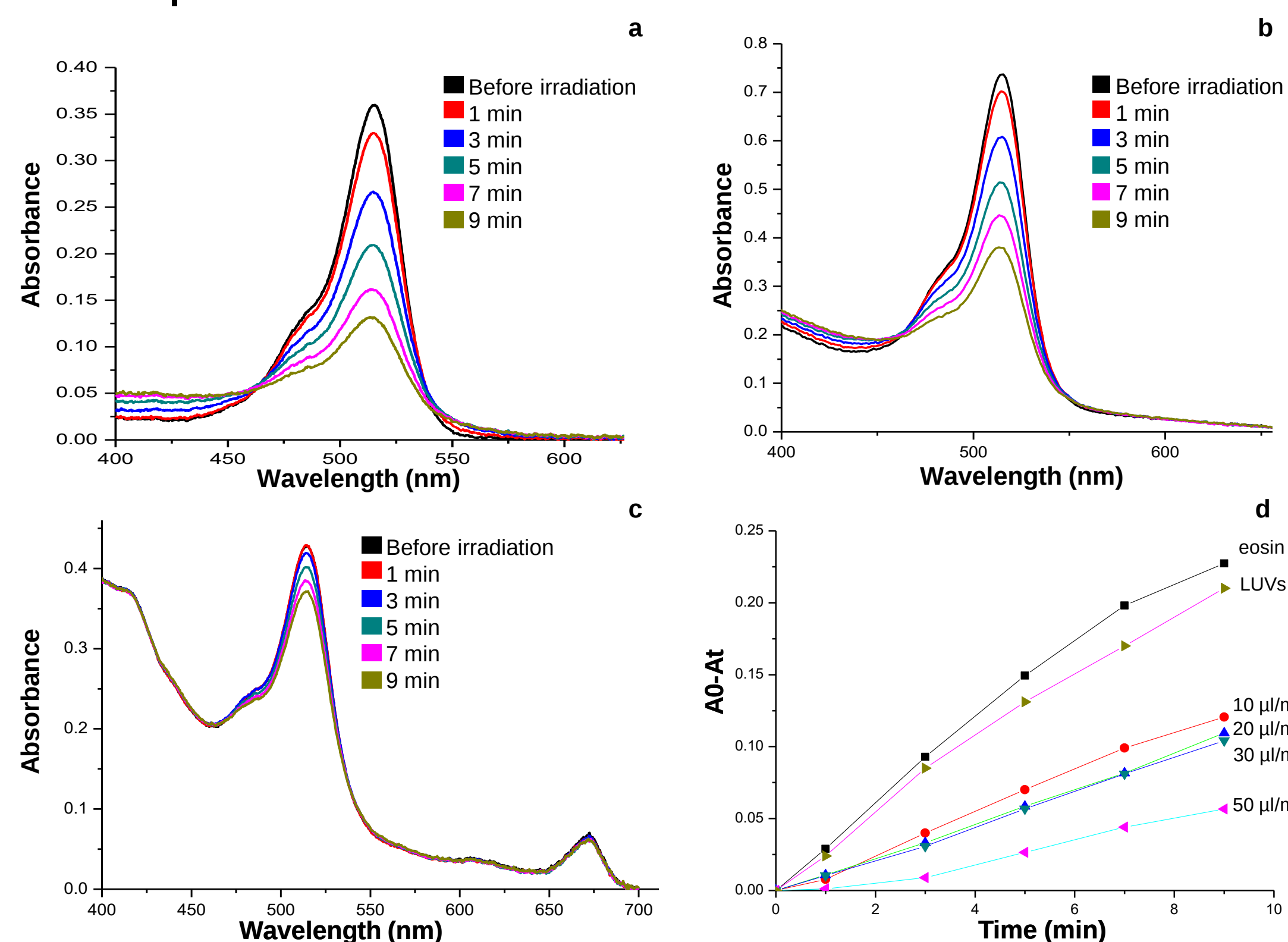


Figure 2: Absorbance spectra of eosin 5.10^{-6} M in (a) water, (b) LUVs solution, (c) 50 µl/ml EECs-LUVs solution, after different times of UV light irradiation. (d) Differences in absorbance of eosin in different solutions, at different times of UV light irradiation.

4- Hemolytic effect of EECs-LUVs:

Treatment	% Hemolysis	Std. error
LUVs	1,64	0,19
EECs	1,64	0,26
EECs-LUVs	1,46	0,13

Table 2: Hemolysis (%) after incubation with LUVs, EECs or EECs-LUVs solutions. Results are expressed as the mean ($n=3$).

- Figure 1:** The enhanced emission intensity of EECs in LUVs suggests that soy lecithin vesicles allowed for the encapsulation of compounds present in the full ethanolic extract of *Cannabis sativa*.
- Figure 2:** Eosin photodegradation shows 50–75% reduction in the presence of EECs-LUVs compared to eosin in water or with LUVs.
- Figure 3:** No significant differences in hemolysis were observed between cells incubated with EECs-LUVs and the control group, up to the highest concentration tested (0.5 mg/mL).

FUTURE WORK / REFERENCES

Future studies will aim to complete the assessment of the biological activity of the encapsulated extract to further explore the potential applications of these EEC-based nanocarriers.

1- Antioxidant efficacy of α -Tocopherol nanocarriers formed by ionic liquid vesicular systems to improve solubility and photostability. Luis F. Berrio Velasco, M. Alejandra Luna, Fernando Moyano, Patricia G. Molina. *Colloids and Surfaces A: Physicochemical and Engineering Aspects* (2025) 726, 138033.