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Exploring ethosomal technology to preserve bioactive plants by-product extracts for cosmetic purposes

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INTRODUCTION & AIM

Natural plant extracts have been used in cosmetics since the early 20th century. Waste biomass from berry crops is being studied for high-value products, with encapsulation playing a key role in preserving plant extracts and enhancing their bioavailability.

Figure 1. Raspberry leaf commercial extract.

Ethosomes, ultra-deformable liposomes with higher ethanol content, have effectively delivered medicinal compounds through the skin without adverse effects. They are used in skin treatments, hair care, skin-whitening agents, and anti-hyperpigmentation treatments. This study presents a novel approach to enhancing the commercial potential of berry crop by-products by encapsulating commercial raspberry leaf extracts within an ethosomal system.

METHOD

Run	Extract % (w/w)	Extract (g)	Ethanol % (w/w)	EtOH (g)	H2O (g)	SPC (g)
1	1.6	0.24	23.60	35.4	114.6	15.00
2	4.4	0.66	23.60	35.4	114.6	15.00
3	1.6	0.24	41.40	62.1	87.9	15.00
4	4.4	0.66	41.40	62.1	87.9	15.00
5	1.0	0.15	32.50	48.8	10.3	15.00
6	5.0	0.75	32.50	48.8	10.3	15.00
7	3.0	0.45	20.00	30.0	120.0	15.00
8	3.0	0.45	45.00	67.5	82.5	15.00
9	3.0	0.45	32.50	48.8	101.3	15.00
10	3.0	0.45	32.50	48.8	101.3	15.00
11	3.0	0.45	32.50	48.8	101.3	15.00

Table 1. Experimental Central Composite Rotational Design (CCRD $2^{2)}$ for the encapsulation process

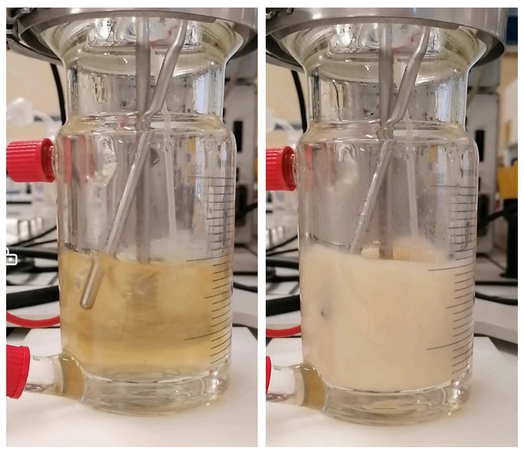


Figure 2. Cold method ethosomes production, aqueous phase addiction, 30°C and 500rpm stirring, and ethosomes formation, respectively.

Ethosomes were produced accordingly using Experimental Central Composite Rotational Design (CCRD $2^{2)}$, followed by the analysis through Response Surface Methodology (RSM) of extract and ethanol concentration effects on:

- Colour
- Particle size
- Entrapment efficiency
- Zeta potential

CONCLUSION

- The obtained results have revealed that vesicle size and colour, two crucial factors in cosmetics, depend significantly on the defined variables, underscoring the significance of our research.
- Further investigation into long-term stability is essential for ensuring formulation effectiveness.
- Encapsulating plant-based biowaste extracts presents a sustainable solution for the cosmetics industry, decreasing environmental impact while improving product efficacy.

RESULTS & DISCUSSION

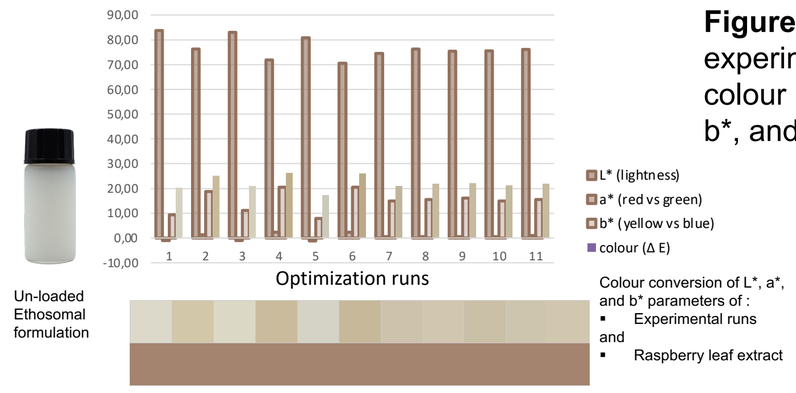


Figure 3. Relation between experimental runs and colour parameters (L*, a*, b*, and ΔE)

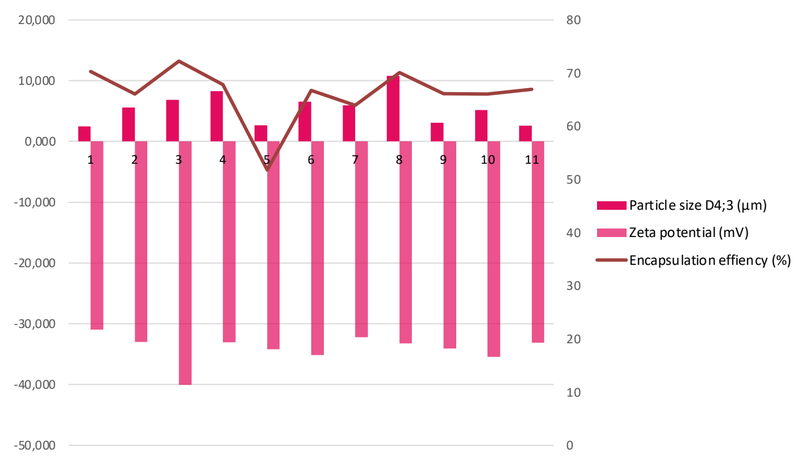
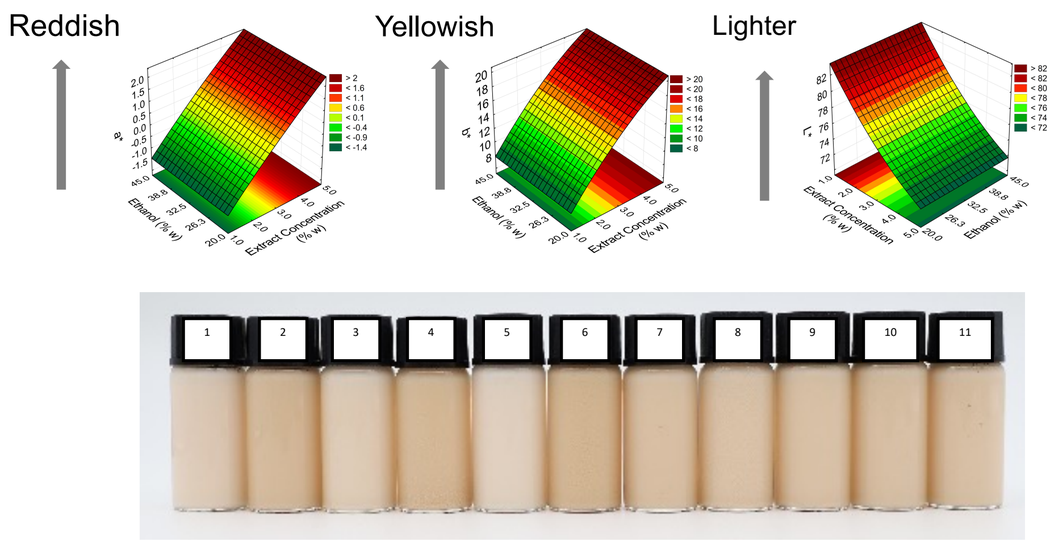


Figure 4. Relation between particle size D4:3 (µm), zeta potential (mV), encapsulation efficiency responses and experimental runs

Figure 5. Effect of encapsulation conditions on colour parameters a*, b* and L*, and visual aspect



Optimum conditions:
Extract 1% (w/w)
EtOH 29.1% (w/w)

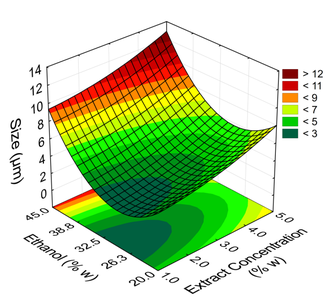


Figure 6. Effect of encapsulation conditions on particle size D4:3 (µm)

FUTURE WORK / REFERENCES

The next step will be the preparation and characterization of the optimal formulation.

References:

1. FAOSTAT, https://www.fao.org, Accessed 14th July 2024.
2. Cosmeceuticals and Active Cosmetics. R.K. Sivamani, J. Jagdeo, P. Elsner, H.I. Maibach (3rdEdition), Boca Raton, CRC Press, 2016.
3. P. Plasencia, T.C. Finimundy, M. Carocho, R.C. Calhelha, M. Añibarro-Ortega, T.C.S.P. Pires, F. Barreiro, P.A. Garcia, L. Barros, S.A. Heleno, Waste and Biomass Valorization, (2024).