TRACE DETERMINATION OF TETRAHYDROCANNABINOL (THC) IN COSMETIC PRODUCTS BY STIR BAR SORPTIVE DISPERSIVE MICROEXTRACTION FOLLOWED BY LIQUID CHROMATOGRAPHY-TANDEM MASS SPECTROMETRY

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INTRODUCTION

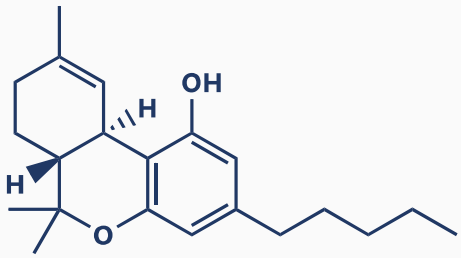
The use of cannabidiol (CBD) and *Cannabis Sativa L.* extracts in cosmetic product has expanded in the last years. **Δ⁹-tetrahydrocannabinol (THC)**, the main psychoactive compound from marijuana, can be present in personal care products as an impurity of *Cannabis Sativa L.* extracts or by undesired isomerization of CBD [1].

The determination of compounds at trace levels in complex matrices as cosmetics needs a sensitive and selective method, usually including a **sample preparation** step where the analyte is extracted and preconcentrated.

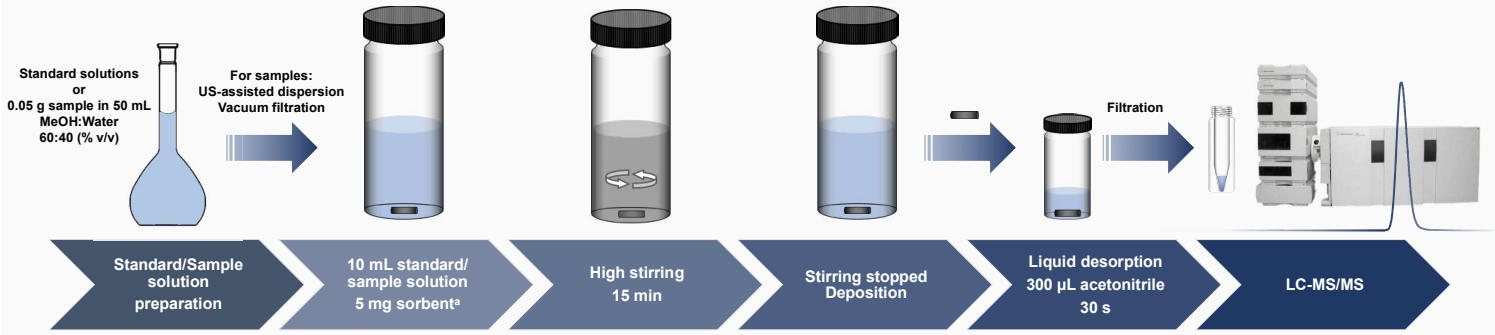
The objective of this work is to develop a sensitive and selective method to determine traces of THC in cosmetic products.

The presented method is based on **stir bar sorptive dispersive microextraction** (SBSDME) [2] followed by **liquid chromatography-tandem mass spectrometry** (LC-MS/MS). In this work, a magnetic composite made of $CoFe_2O_4$ magnetic nanoparticles (MNPs) embedded into a commercial reversed-phase polymer (Strata™-X-RP) was employed as magnetic sorbent material and THC-D_3 was used as surrogate.

Δ⁹-Tetrahydrocannabinol



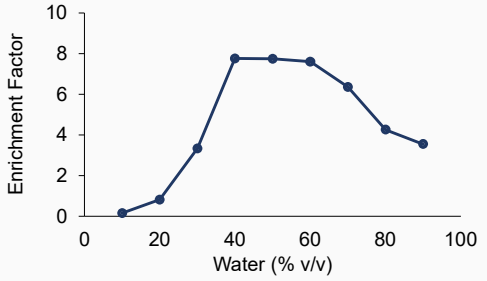
EXPERIMENTAL



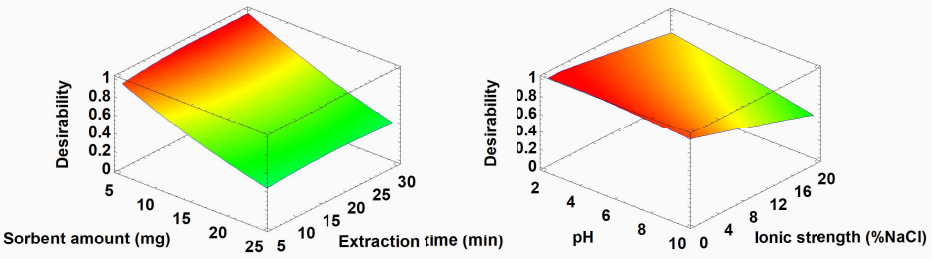
[a] $CoFe_2O_4$ MNPs embedded into Strata™-X-RP polymer

RESULTS AND DISCUSSION

Preliminary study of the donor phase composition



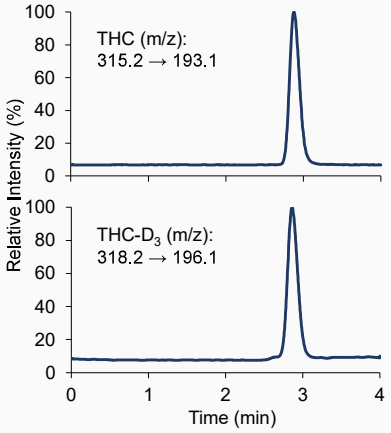
Response Surface Methodology for the extraction procedure (Box-Behnken design)



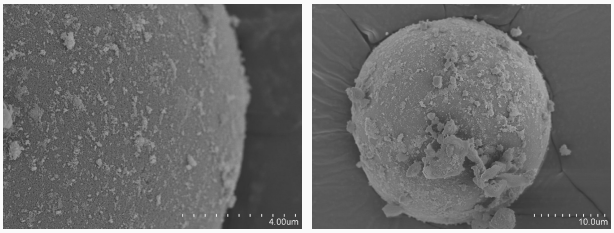
Figures of merit of the proposed method

R^2	Enrichment Factor	MLOD (ng g^{-1})	Intra-day Precision (RSD, %)			Inter-day Precision (RSD, %)			Relative Recoveries (%)
			0.05 ng mL^{-1}	1 ng mL^{-1}	10 ng mL^{-1}	0.05 ng mL^{-1}	1 ng mL^{-1}	10 ng mL^{-1}	
>0.9994	19.3 ± 1.2	2.2	9.8	3.4	0.7	9.5	5.9	8.4	99 - 109

Chromatogram



$CoFe_2O_4$-Strata™-X-RP



Analysis of cosmetic samples

- **10 cosmetic samples** including 'cannabis sativa seed oil' or 'cannabidiol' as ingredients were analyzed:
  - Creams
  - Facial masks
  - Hair masks
  - Shower gels
  - Refreshing gels
- All of them were below the MLOD except for one, which contained 3.5 ± 0.4 ng g^{-1} of THC.

CONCLUSIONS

- Good **analytical features** were obtained in terms of linearity, limit of detection, precision and relative recoveries.
- This new approach was successfully applied to ten real cosmetic samples of different matrices, thus showing it is suitable for the **analytical control of THC in cosmetic products**.
- The proposed methodology overcomes some of the drawbacks of the previous works with the same purpose, such as the higher limits of detection, time-consuming procedures, and consumption of large volumes of organic solvents.

REFERENCES

[1] R. Mechoulam, L. Hanus, Chem Phys. Lipids 121 (2002) 35
[2] V. Vállez-Gomis, J. Grau, J.L. Benedé, D.L. Giokas, A. Chisvert, A. Salvador, Anal. Chim. Acta 1153 (2021) 338271

ONLINE VERSION

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