

# of total oil in microcapsules using <sup>1</sup>H-NMR

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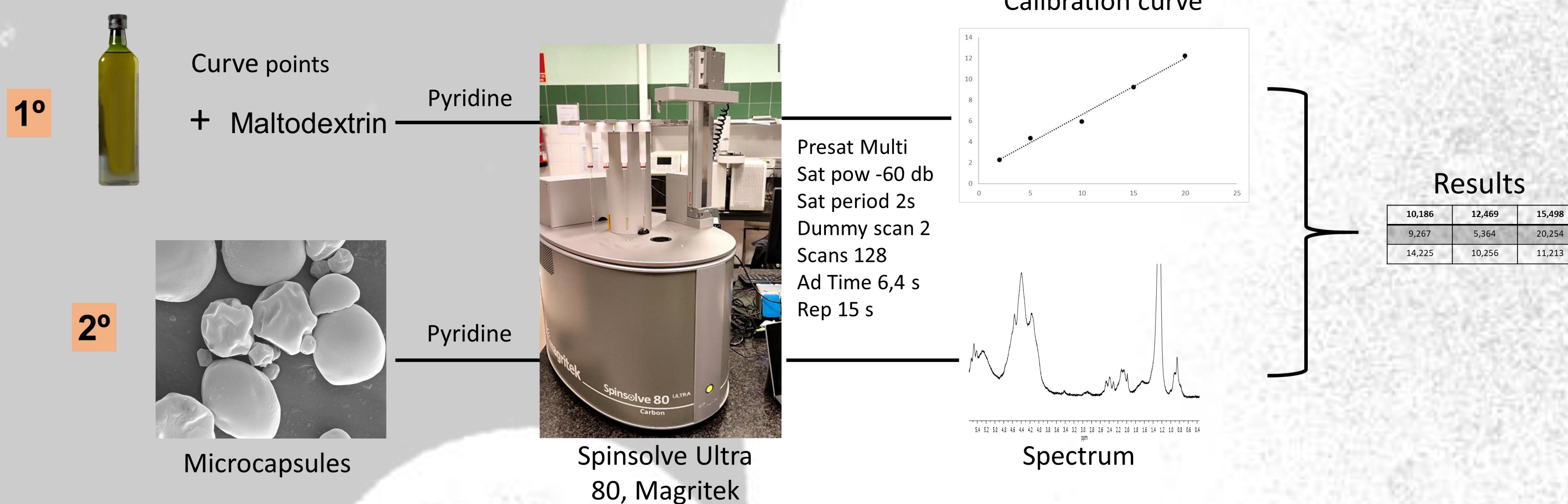
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## Introduction

The microencapsulation is a widely used technique to protect and add bioactive compounds to food matrices, as it is the case oils rich in omega-3 fatty acids. This type of microcapsules should be physico-chemically analysed to guarantee their adequacy, being the microencapsulation efficiency (MEE) one of the most important determinations. MEE refers the percentage of encapsulated oil in relation to total oil in the microcapsules, being needed the determination of external and total oil in the microcapsules. External oil is normally analyzed gravimetrically by extraction with petroleum ether, while an acid digestion followed by an extraction with hexane is carried out to calculate total oil (1). Therefore, the objective of the study is to verify the capacity of NMR to determine the total oil in microcapsules.

## Material and methods



All analyzes were performed in triplicate.

## Results and discussion

Figure 1 shows the signals belonging to the wall material and those of all the oil present. The value used for quantification is the one obtained by the integration of the signal at 2.4 ppm, belonging to the hydrogens attached to the alpha carbons of the carbonyl group of all the fatty acids (2). Table 1 exposes the percentage of total oil in oil microcapsules with different wall materials (Maltodextrin, M and maltodextrin-chitosan MC) determined by means of the traditional method and after applying the NMR procedure developed in this work. No significant differences were found between methods, and it is noted lower standard deviations in data from NMR analysis, which may point out a good repeatability.

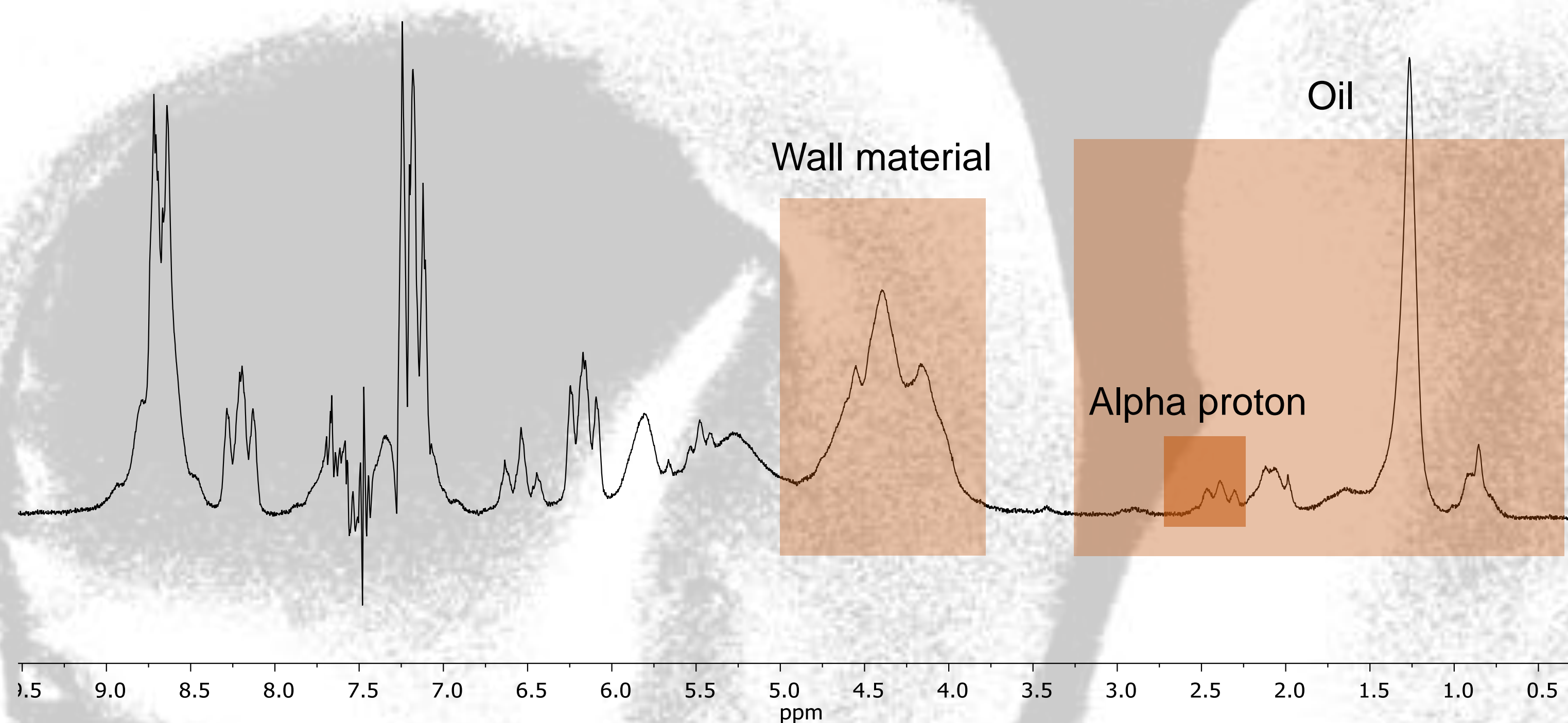


Figure 1: <sup>1</sup>H-NMR spectrum of microcapsules, obtained in 80 MHz low-field spectrometer, using pyridine as solvent

Table 1: Percentage of total oil in oil microcapsules with different wall materials by means of NMR and traditional method.

Microcapsules	NMR	Traditional method	p
M1	10,873 ± 0,637	11,075 ± 0,675	0,400
M2	10,430 ± 1,000	10,835 ± 1,472	1,000
M3	10,418 ± 0,316	12,100 ± 0,814	0,100
M4	9,566 ± 0,291	9,830 ± 0,338	0,700
MC1	7,085 ± 0,360	7,367 ± 0,783	0,700
MC2	7,949 ± 0,576	8,829 ± 1,519	0,700
MC3	5,172 ± 0,617	5,597 ± 0,668	0,200

## Conclusion

Results on the present study points out the capability of the <sup>1</sup>H-NMR technique in combination to the procedure developed in this work to quantify the total oil in microcapsules.

## Bibliography

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- Magritek Determination of fat, lactose and water content in milk. URL: <https://magritek.com/applications/food-screening/>

## Acknowledgmen

Junta de Extremadura – Consejería de Economía, Ciencia y Agenda Digital, Unión Europea - FEDER (Fondo Europeo de Desarrollo Regional) (IB20138);