Chemical composition determination in meals ready to eat (MRE) by Near Infrared Spectroscopy

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Context

Nowadays the feeding behavior has changed considerably, especially in developed countries where people are always more busy and turns to meals ready to eat. As most of these MRE are not always nutritionally well balanced, the consumers are facing problems of obesity which is as risk factor for many illnesses as diabetes, cancers and cardiovascular disease.

Regulation

A correct labelling of the MRE with clear and accurate nutrition information is the best way to inform effectively the consumers. Furthermore it is now a legal requirement. The EU regulation n°1169/2011 forces the producers to label correctly their products

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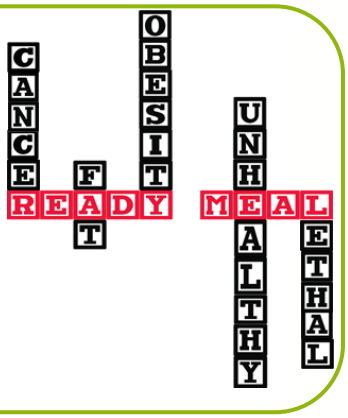
REGULATION (EU) No 1169/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2011

on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004

Nutrition Facts / Valeur nutritive
Per 1 container (454 g) / pour 1 contenant (454 g)

Amount / Teneur	% Daily Value / % valeur quotidienne
Calories / Calories 520	
Fat / Lipides 13 g	20 %
Saturates / saturés 5 g + Trans / trans 0.2 g	26 %
Cholesterol / Cholestérol 30 mg	
Sodium / Sodium 1150 mg	48 %
Carbohydrate / Glucides 74 g	25 %
Fibre / Fibres 5 g	20 %
Sugars / Sucres 9 g	
Protein / Protéines 21 g	
Vitamin A / Vitamine A	15 %
Vitamin C / Vitamine C	30 %
Calcium / Calcium	15 %
Iron / Fer	35 %



Methodology

In this context it is obvious that a rapid, cost effective and accurate technique analysis as NIRS is a useful tool to allow the quantification of the main parameters of MRE. 150 samples covering a large variety of MRE as lasagna, hamburger, rice, Chinese dish, chicken mix, were ground and analyzed by wet chemistry and scanned on a NIR spectrometer

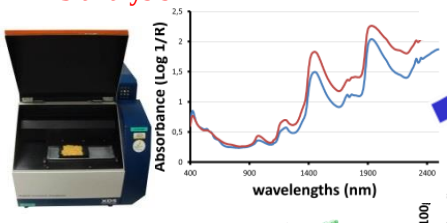
150 MRE samples

Grinding

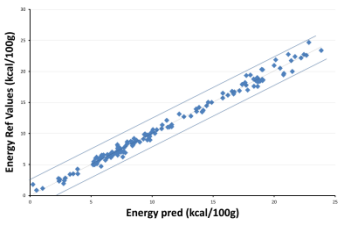
Chemistry (Ref. Values)

- Energy (by calculation) [kcal]
- Dry matter (DM) [%]
- Protein [%]
- Fat [%]

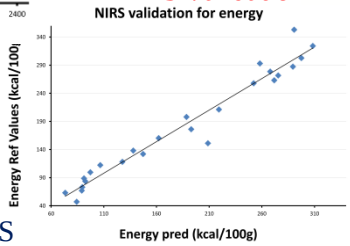
NIRS analysis



NIRS calibration



NIRS Validation



CALIBRATION PERFORMANCE

Parameter	CALIBRATION					
	Termes	N	SD	R^2	SECV	RPD
DM (%)	5	119	11,58	0.98	2.13	5.44
Fat (%)	6	120	9,50	0.97	1.94	4.88
Protein (%)	7	120	6,05	0.98	1.24	4.90
Energy (kcal)	3	98	90,43	0.96	18.99	4.76

Parameter	VALIDATION						
	N	SD	R^2	SEP	SEPC	RPD	Biais
DM (%)	29	11.78	0.92	3.49	3.52	3.37	-0.45
Fat (%)	29	9.38	0.97	1.60	1.63	5.85	0.07
Protein (%)	30	5.91	0.98	0.89	0.90	6.61	-0.09
Energy (kcal)	25	94.79	0.96	22.00	22.26	4.31	-2.89

According to the RPD values, NIRS analysis allows the quantification of the main parameters(DM, fat, protein, energy) of most of the MRE found on the market.

Conclusions

This study shown that it is possible to use universal NIRS calibrations regardless of the type of MRE to quantify precisely the main properties, including the energy. This method can be very useful for the producers to label correctly their products to meet the regulation requirements

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